

Our Great Outdoors

Mammals



C.W.G. Eifrig

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OUR GREAT OUTDOORS
MAMMALS



Courtesy Nature Magazine, Washington, D. C.
The American elk or wapiti

OUR GREAT OUTDOORS

MAMMALS

By

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THE PREFACE

The purpose in writing this book was not to add another to the great number of books on nature and nature study with which the market is already flooded. It owes its origin, rather, to the desire expressed to the writer by teachers and teachers' conferences for several years back that he get out a book of this kind to be used by them and their pupils.

But why not use one or the other of the many books already on the market? There are several reasons. In many of the nature-study books the subject matter is presented in such a fragmentary and disconnected manner that the impression left on the mind of child or adult alike can only be hazy, disjointed, and unpleasant. If a book on things outdoors hops, skips, and jumps from the horse to the rainworm—perhaps even the rainbow—then to the daisy, then dives into the coal mine, next leaps to the stars, then has a lesson on the kingfisher, after that one on the bee, to be followed by one on the whale, each short or diluted to the weakness of a homeopathic dose, the result in the mind of either child or adult cannot be an orderly, sympathetic understanding and appreciation of the wonders in the material universe. The treatment adopted here presents the material in a connected and systematic arrangement, bringing together what belongs together. This does not mean, of course, that a teacher giving a course on mammals must take all the material offered in this book, or necessarily proceed in order from chapter to chapter or from one paragraph to the following one. The proper method is to pick and choose what one needs.

On the other hand there are many beautiful books on the market on the various phases of nature, embellished with fine pictures in black and white or in colors, but they are, as a rule, so expensive or so bulky that they can be available only for the school library or that of the teacher, and not as reading books in the hands of pupils.

Most nature books published in our country treat of American animals only. The writer feels that at least a passing acquaintance with the most notable forms of animal life in foreign countries is desirable. Hence they are included in this book.

The idea has been expressed to the writer that the text be made into differing lessons for the several grades, and that questions and exercises be added to each one so that they may be "gone through," or "taken in," without much thinking on the part of teacher and pupil. But the writer is so firmly convinced that what our teachers want and need is information along these lines rather than specimens of schoolroom method, that he has chosen the style of treatment shown in this book. Besides, schoolroom methods, in all their phases, are continually, year in and year out, treated at teachers' conferences and in school journals. It would indicate a belief in such a lack of pedagogical ability on the part of teachers as to be downright humiliating. It would also make the book needlessly bulky. Hints as to additional uses to be made of this material are given in an appendix written by Professor Diesing. A glossary of words used is added also, as well as a bibliography.

Some may wonder how this book, containing biographies and short sketches of mammals only, can be called something complete. But this book is merely the first of a series. Others will soon follow—one on birds, another on the remaining vertebrates, one on the invertebrates, and finally one on plants, all treated in a novel manner so as to engage, if possible, the interest of children and adults alike.

I wish also to extend here my sincere thanks to a number of friends and colleagues who have been of great assistance to me by reading through the manuscript and offering valuable suggestions; also to the authorities of the Field Museum of Natural History, Chicago, and the New York Zoölogical Society, who have kindly consented to the reproduction of a number of photographs from their respective collections. Among the best books on

mammals ever published are Stone and Cram's *American Animals*, published by Doubleday, Page & Co., and a European book covering the whole animal kingdom, Schmeil's *Lehrbuch der Zoologie*, published by Quelle und Meyer of Leipzig, Germany. Both publishers have courteously permitted the reproduction of a number of cuts and plates in their respective publications after the authors of many of them—Mr. A. R. Dugmore, Mr. W. E. Carlin, and others—had graciously given their permission. Finally, I am under a debt of gratitude to several of my former and present pupils at Concordia Teachers College, who have drawn many of the figures and diagrams found in the book, as well as helped me in photographing mounted material.

May this book go forth and achieve the purpose for which it was written—to be of service to teachers and pupils, to old and young, in school and in the home, and bring them to a higher and greater appreciation of the beautiful and wonderful handiwork of the Creator about them and kindle a lasting interest in the things of our great outdoors.

River Forest, Illinois, 1928

C. W. G. EIFRIG

THE INTRODUCTION

Every child is a born naturalist. With what utter abandon he turns over and investigates a worm, a bug, or a beetle that crosses his path! He is then oblivious to everything else. Or watch the sparkling eyes of children when stories of animals are being told them. Nor are most grown-ups very different in this respect. This is but natural, as adults have taken into their maturity much more of the boy or girl spirit than they are usually aware. Only the many questions of business, money-making, and everyday life have largely suppressed the youthful interest in nature, or put a thin blanket over it for the time being.

This is a great pity. One's pleasure in life and enjoyment of it can be greatly and inexpensively increased by keeping eyes and ears open to see and hear the things of nature. Once the writer had to make occasional trips to one of the tiny settlements on the northern fringe of settled Quebec. This necessitated a short ride of twenty-five miles by train and then one of similar length in a buggy or sled, depending on the season. My companion was the mail driver, who took what little mail there was that went to this little outpost of civilization. At any time of the year it was a source of intense enjoyment to watch from the seat beside the driver the things going on about one in nature. There was the procession of wild flowers, changing form and hue with the varying season, the changing mood and appearance of the trees, from the brilliant scarlet and orange of the maples in the fall to the somber black-green of the pines and the spruces, the pageant of the birds, either moving in during spring or thinning out in autumn, the flitting butterflies along the roadside, the mammals, the changing aspect of the woods and hills, with or without a mantle of snow. At the end of the trip I would sometimes ask the driver: "Mr. B——, how many kinds of birds do you think we saw on our trip today?" He would scratch his head and say, "Oh, I guess about five or six." And when I told

him "Thirty," he would simply not believe it. That shows how much more one can get out of life or out of an otherwise monotonous day or hour by having learned to be appreciative of what goes on about him in God's great outdoors.

The more is the pity that so few people make use of this source of keen enjoyment. The traveler in Europe cannot fail to note the great difference there in that respect, especially in the countries of central and northern Europe. Many boys there have some kind of a collection of natural objects, such as butterflies, beetles, pressed flowers, or leaves. A collecting vasculum is a very common article in a boy's outfit. The people from their youth up live and commune with nature to a much greater degree than is true with us. One marvels at the measure of familiarity with nature possessed by workingmen, farmers, and city dwellers alike—how intimately they know the trees, flowers, birds, and mushrooms.

If we are to bring about a similar desirable condition here we must, as over there, begin with the children in school. The teacher must first be interested and have some knowledge of, and love for, the subject. To help in supplying this, the present book has been written. Then the writer's idea was that it should also be a textbook in the hands of the children, except in the first three or four grades, where the telling of the story by the teacher is the best way to interest children.

The story-telling may be augmented by little exercises in sentences and composition, and by drawing some of the animals discussed. This latter is to be amplified in the higher grades, where the material can be used in various ways in composition, writing short essays, and the like. Another use the writer had in mind was that this book be employed as a supplementary reader in the schools, as well as for reading in the home circle.

For assignment of language and other work in connection with these animal biographies, see the suggestions offered in the appendix by Professor A. Diesing. The wide-awake teacher will supplement the book by pictures in the classroom and by trips afield,

or to a museum or zoölogical garden, if one is at hand. Getting the children busy in procuring specimens for a small school museum is another way to arouse an interest that may last a lifetime. A few flowerpots, where the sprouting, growing, and blossoming of plants can be watched in the classroom, is an admirable way to help in this. If an aquarium or a terrarium, or both, can be got into the classroom the happiness of the children will be complete. In the aquarium not only fishes may be watched, but also the transformation of frog eggs into tadpoles, and of the tadpoles into frogs, or the larval and nymph stages of insects. In a terrarium lizards, snakes, and turtles may be observed, as well as the wonderful metamorphosis of a larva or caterpillar into the pupa or chrysalis, and out of that into the imago or adult.

The reader will perceive that stress has been laid on the correlation between the structure of the body of the animals and their mode of life, their manner of food getting, and their environment. This emphasis should also be brought out by the teacher when telling the stories, and by the children when reproducing them in writing or orally. Just here is where one can always see the design and purpose of the great Designer and Creator. *Our Great Outdoors* will also serve its purpose if one or several copies are put into the school library.

Hoping that this book may do a little toward helping old and young to a more intimate knowledge and a more loving appreciation and enjoyment of nature, the writer bids it go forth on its mission.

THE AUTHOR



A jaguar. A striking example of protective pattern in coloration.

OUR GREAT OUTDOORS

MAMMALS

FIRST MAMMALS, OR PRIMATES

Although there are many points of resemblance in structure between the apes and man, there are also great differences. Just compare the two skeletons (Fig. 2, p. 2). In the skull of the ape the jaw part is largest and most prominent; in man's, the brain cavity. The forehead of the ape is strongly receding, leaving only a small cavity for the brain, while man's forehead is nearly straight and rises perpendicularly. The skull of the ape also sits differently on the spine. Apes have no chin and no nasal bone; their nostrils open forward instead of downward like man's. There is a large cranial ridge of bone running from the center of the low forehead back over the skull to give space for the fastening of the powerful muscles controlling the large lower jaw. Also the bony ridges over the eye are large and prominent, giving the apes, especially the gorilla, a hideous appearance.

Notice the long arms dangling from the side of the bent-over frame of the ape, and then observe the straight, upright posture of man. The arms of the ape are so long that he can walk on all fours with little bending down, and that is his usual way of walking. The pelvis or hip region in man is broad, making his body widest there, whereas in the apes it is narrow. The apes have no calf to the leg as man has,

and the big toe is a thumb, standing at right angles to the foot. Nevertheless apes do not have four hands, as many people think, but their lower extremities are true feet because they stand at right angles to the axis of the leg.



FIG. 2. *Skeletons of orang-utan and of man*

In order to be hands they would have to continue forward in the same axis or direction as the arms, as we see in our own hands.

Indeed, a glance at the two skeletons shows man to be a much nobler, higher creature than the ape. And although apes may be taught much in manlike behavior, there is still a vast difference between them and man. Apes, for example, can never be taught speech, which at once puts man immeasurably above them.



Courtesy Quelle und Meyer, Leipzig

FIG. 3. *A family of orang-utans*

Note the large gular pouch of the male, and the nest in the crotch of the tree

Monkeys differ from apes in that they are smaller and have tails, which many of them use as a hand. Apes are found in the Old World only, monkeys in both the Old World and the New World.

APES

The orang-utan. The orang-utan, a name which means "man of the woods," is one of the so-called manlike apes.



FIG. 4. *Head of an orang-utan, showing gular pouch but not cheek pouches*

He lives in the endless and trackless forests and jungles of Sumatra and Borneo. The male orang-utan is about four and a half feet high, the female smaller. The face is smooth, but has long hair around it as well as all over the body—hair a foot long and of a reddish brown color. The male orang-utans have large cheek pouches and a large gular or throat pouch, which, together with the protuberant jaws and the little nose and eyes,

give them a rather ugly appearance. The cheek pouches consist of fat, but the laryngeal or throat pouch is hollow, probably to give the voice greater resonance or carrying power.

The orang-utan lives in the trees, rarely coming to the ground. Hence his whole structure is in accordance with this kind of life, as the otter is adapted to the water and the mole to a life underground. His long arms and fingers enable him to grasp limbs firmly and swing from tree to

tree; the thumb is small and far down (Fig. 5) and does not come into play there. The legs are short. The orang-utan's food is fruit, such as breadfruit, also the eggs and young

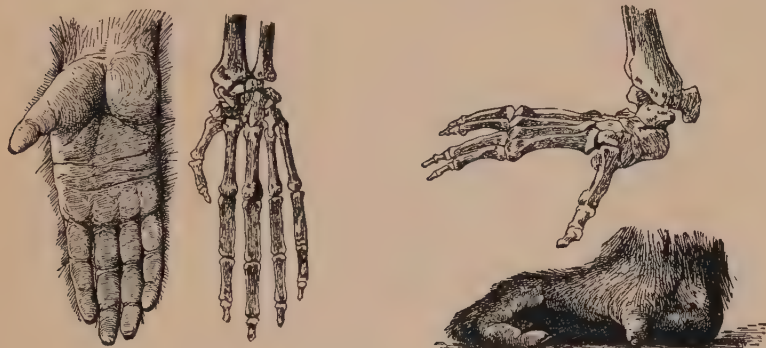


FIG. 5. *Hand and foot of an orang-utan*

After Schmeil



FIG. 6. *Skull and left half of upper jaw of an orang-utan; C, canine*

of birds. The teeth are somewhat like those of man, except that the canines are much larger (Fig 6).

The orangs have but one young at a time, which the mother carries around with her until it is able to shift for itself.

Every evening they construct for themselves in some tree a platform of branches and twigs for a bed, sometimes covering themselves with more leaves and branches. They do not live long when taken into the temperate zone, consequently they are seldom seen in zoos and circuses.



After Schmeil

FIG. 7. *A chimpanzee in a tree, holding a banana in his hand and a second banana in his foot*

The chimpanzee. The chimpanzee is the most intelligent of the apes, but whether his intelligence is greater than that of the elephant or of the collie dog is doubtful. He can be taught to act much like a man, to eat from a table, to use knife and fork, and to drink from a cup. His appearance is also less disagreeable than that of the orang or gorilla. He lives in equatorial Africa from the Gulf of Guinea to Uganda. He is five feet high when standing erect, black or brownish black in color, and walks on all fours.

The chimpanzees make beds in trees in which to spend the night. Some specimens have lived for years in zoölogical gardens in Europe and America and amused thousands of spectators with their mimicry of human actions, their droll behavior, and their playfulness.

The gorilla. The gorilla is the largest and most powerful of the apes. He is also the most hideous in appearance. He

may attain a height of six feet when standing erect, though this he rarely does, since normally he walks on all fours. He weighs up to four hundred pounds; his neck is thick, his breast broad, and his jaws and arms of enormous power. His feet are built more for walking on the ground than are those of the orang and chimpanzee, which are more arboreal in habit. His color varies from deep black to iron-gray, with a reddish tinge on the head, while old animals become grizzled. The breast is bare, and it is said that the animal beats or drums on it with his fists when excited or angered. Then his usual grunt becomes a terrifying roar. He emits a strong rubber-like odor. Gorillas make beds of oblong shape for overnight, the females up in the trees, the males often on or near the ground.



After Schmeil

FIG. 8. *An old male gorilla*

The bachelors make their beds on the ground, while families sleep in trees

MONKEYS

Baboons and their relatives. Among the monkeys commonly seen in zoölogical gardens are the baboons. These are among the least attractive of monkeys, for baboons have surly, vicious dispositions, large doglike heads, short tails, and the four legs all of equal length. Therefore they cannot climb as well as they can move over the ground.



After Schmeil

FIG. 9. *Black howling monkeys of South America*

They live in Africa, especially in hilly and rocky regions. They are gregarious, living in troops. While they usually flee before man, they cannot always be depended upon to do this, for if anything angers them they are prone to attack, or at least to throw stones. They have inside cheek pouches and callouses on their buttocks. Their colors are various shades of gray, brown, and yellow.



After Schmeil

FIG. 10. *A gibbon walking on the ground*
Note the position of the arms for balancing

To the baboon tribe belongs the *mandrill*, which is the largest of baboons. This monkey attracts attention by the bright colors on its face and buttocks. These colors are quite startling, a bright blue and a fiery red side by side. At the same time the mandrill is a surly brute, with enormous jaws and teeth. Some mandrills have white whiskers around the face and a white cloak on the breast.



Courtesy Field Museum

FIG. 11. *Howling monkeys in a tree in British Guiana*

To these doglike monkeys belongs also the *green monkey*, often seen in collections. But it is smaller and better looking than the baboons. Here also belong the various *macaques* which are found from the Rock of Gibraltar in Europe through northern Africa, across Asia, and into Japan. To these belongs the *sacred monkey* of India, which destroys the fruit and crops of the people, who will not kill one of them because they hold them sacred, as they do all animal life. The *Rhesus monkey* from India and Ceylon is also often seen in collections.

Monkeys of the New World. The monkeys of the New World are known for their long prehensile tails, with which they swing from tree to tree or, in some cases, even grasp things as with a finger. The best known is the *howling monkey*, found in the forests from Central America to the

Argentine. These animals live in the tree tops in troops and derive their name from the fact that they perform in



FIG. 12. End of prehensile tail of spider monkey

the morning and evening a concert of most hideous howling. It sounds as if all the wild animals of the forest were engaged in fierce battle. This loud voice is produced by a boxlike bony enlargement of the larynx and the end of the tongue.

The *spider monkey* is so called from the thinness and length of his legs and tail (Fig. 12). The tiny *Capuchin* monkeys, *squirrel monkeys*,

and *marmosets* are often found in animal stores, and they make interesting and amusing pets.

LEMURS

The lemurs. Besides the apes and monkeys, there is a third class of primates, the lemurs. These curious creatures, living mainly on the island of Madagascar, differ from the apes and monkeys both in appearance and in habits. Some of them are nocturnal in habit, hence these have large eyes. Some build nests like birds, and some of them spend the dry season asleep in hollow trees, exactly as our bears do during the winter. They are mainly fruit-eating, hence arboreal, although some species are omnivorous.

Lemurs look more like foxes, rats, or small bears than like monkeys, and owing to their peculiar habits and appearance the natives have many superstitions about them.

WINGED MAMMALS, OR CHIROPTERS

THE BATS

Bats are among our most remarkable mammals because they can fly. Since they hide themselves in the daytime, only coming out at dusk or dawn, or in the night, superstitious people of all ages have connected them with what was uncanny, with evil portents and with evil spirits. The devil, goblins, and other unholy beings have been pictured in the form of bats, or at least with the wings of bats. This is all nonsense of course. Bats are very useful little creatures. But it is true that, owing to their nocturnal and secretive ways, less is known about bats than about most other mammals, even about such animals as are not found in our own country, as the lion and the tiger. But that is our fault, not theirs.

Bats are of the greatest service to us by helping us in our fight against the ever increasing number of insect pests which seek to destroy our crops or our comfort, or both. And since they are nocturnal, they work for us while we sleep. They catch night-flying insects, such as mosquitoes, May and June beetles, moths, and millers, some of which in their larval stage are among the greatest enemies of fruit, shade, and forest trees.

Let us see how the bats' peculiar structure is merely an adaptation to their mode of food getting. As they continue the work of the diurnal insectivorous birds, and as their prey is winged, they also must be winged. As they have hands on their fore limbs, they are hand mammals. They have no feathers, and the wing is only a membrane of

nearly hairless skin stretched over and between the greatly elongated finger bones of their hands, leaving out the thumb, which is small. The membrane extends to the hind limbs also, leaving the feet free, but including the tail, at least in the northern species. Free-tailed bats live in the South.

With this skin-wing bats can flutter and fly nearly as well as most birds. Furthermore, the head and body are small and the bones, while not hollow, are thin and therefore light. The muscles working the wings are strong.



Courtesy Field Museum

FIG. 13. *A bat in flight*

Note the thumbs at the bend of the wings

Still, bats cannot fly so long or so gracefully as birds, and neither can they soar. They get out of breath easily, as do all mammals when they work their fore limbs rapidly, so they must rest often.

Since bats are nocturnal we should expect them to have large eyes, as do the owls, the flying squirrels, and others. But on the contrary they have small eyes. Why? Because large eyes would make them top-heavy, so that they could not fly so well. For their lack of large eyes they are compensated by having an unbelievably keen sense of touch and hearing. Their sense of touch is located largely in their membranous wings, which are kept well oiled. For hearing

they have large ears, at the entrance of which is a small bony projection, called the tragus (Fig. 14), which probably acts like the receiving antennae of a radio. And their eyes, though small, are very keen and strong.

The following experiment made with bats shows how extremely acute their hearing and feeling must be. Bats that had previously been blinded were released in a room



After Behneil

FIG. 14. *Skeleton of bat drawn into outline of the body*
D, thumb; T, tragus

in which many wires and strings had been stretched—a regular tangle. Yet the fluttering bats would not touch any of them. The explanation seems to be this: When the wings of the bats set air waves in motion the tiny interruptions of the waves caused by these wires and threads are thrown back and sensed by the flying bats in time for them to dodge the obstruction.

As the flight of bats requires great exertion on their part, they must put much fuel into their engines—that is, they

must feed voraciously. A certain bat in captivity ate twelve May beetles for one meal. This shows how useful bats are in their nocturnal warfare against insects. Their teeth are those of the flesh eaters, resembling in that respect those of the moles and shrews, but very small, appearing more like the points of so many needles. These teeth pierce and tear the insect.

In the daytime bats sleep in dark, out-of-the-way places, such as attics, church steeples, caves, and other dark nooks and corners. There they hang suspended by their hind feet, and from this position they can readily launch themselves forth on their wings. On the ground their movements are slow and ungainly. Contrary to the general rule among mammals, their forelegs are better developed than their hind legs, and their knees bend backward instead of forward.

Some of our bats migrate south in the fall, while others stay north all the year round. These latter hibernate in their accustomed dark corners. But how can they endure the great cold that often prevails in winter over the northern United States and Canada? Their body temperature drops down to fifty-six degrees, the pulse begins to beat slowly—but once every three minutes—and the breathing is barely noticeable. But even so energy is consumed. Where does it come from? During the plentiful insect supply of the warm summer and early fall nights, they accumulate for themselves a layer of fat under the skin. This fat now



FIG. 15. *Hair of bat*

enters the blood and by it is taken to the different organs. The bat's fur is also very thick. Some one has figured out that it takes about one and a half million hairs to cover one of them. The hair differs, too, from that of other mammals.

Looked at under a microscope, it is seen to consist of little tubes, each fitting into the next lower one, like the pipes of the scouring rush (Fig. 15).

A guide at Wyandotte Cave in southern Indiana, near Corydon, and those of Mammoth Cave, Kentucky, have told me that in the fall thousands of bats enter these caves. They cling to the rough ceiling, often several layers deep. Here they hang, torpid, apparently lifeless, until spring, and then within a few days they all fly away.

Now the temperature in these caves, summer and winter, is fifty-two degrees, and there is absolute darkness all the time. How do the bats know when it is time to leave?



After Schmeil

FIG. 16. *A bat hibernating*

In July bats have two or three young which the mother carries about with her for a while on her nightly sallies. They adhere to the fur on her breast. When they become larger she hangs them on a twig or branch, so that she can fly better.

Species of bats in the United States. *Hoary bat.* The fur is mingled dark brown and yellowish brown tipped with silvery white, whitish below. The length is five and a half inches; expanse of wings, twelve to fifteen inches. It is the largest of the bats of the northern and middle states. In the fall the hoary bat migrates south, returning to the northern states in the spring.

Red bat. The red bat is a bright rusty red to grayish rufous, tipped with white, with a whitish patch in front of each shoulder. The interfemoral membrane (from hind leg to hind leg around tail) is also densely furred. The length is four and a half inches; expanse of wings, eleven inches. It is found from Canada to the Gulf, and is one of the commonest species.

Silver-haired bat. The fur is dark brown or black, with white tips. The interfemoral membrane is sparsely furred, the ears short and rounded. It lives in Canada and the northern United States. Its length is four inches; the expanse of wings, nine to ten inches.

Pipistrelle. This bat is a light yellowish brown, mottled with dusky; below, it is yellowish brown. Its length is three and a half inches; expanse of wings, eight and a half inches. Its home extends from Pennsylvania to Iowa.

Little brown bat. The fur is a glossy brown, paler below, with the wing membranes naked except near the body. Length, three and four-tenths inches. It lives from the Rocky Mountains east over all of North America. This and the Pipistrelle are the smallest of our bats.

Large brown bat. This bat is about the same as the preceding, except that it is an inch or more longer—four and six-tenths inches.

Big-eared bat. This bat is yellowish brown above, grayish white below, with the throat darker and tinged with yellow. All hairs are dark brown at the base. It has very large ears, joined in front. It is four and two-tenths inches long. Its home is from the Ohio River south to the Gulf.

Florida free-tailed bat. The color is dark brown, the hairs white at the base. The ears are very large, the tail free

of membrane. The length of the Florida free-tailed bat is only two and a half inches.¹

Leather-winged bat. This bat has light yellowish brown hair with dusky tips. The wing membranes are thick,



FIG. 17. *Flying foxes, or fruit bats*

After Schmeil

leathery, and large; expanse, sixteen inches. It lives in the Gulf States.

Twilight bat. The color is a dull umber brown, lighter below. The wings are leathery, with sparse fur. The length is three and seven-tenths inches; expanse, nine inches. It is found in the Gulf States and northward.

A number of species of bats are found in our Southwest, especially in southern California, which indeed seems to be a paradise for bats.

Non-American bats. In South America live several species of leaf-nosed bats, so called from a peculiar leaflike

¹If only length of body is taken into consideration, and not extent of wings, this is the smallest mammal in existence.

growth on the nose, similar to that of the star-nosed mole. Here belong the *vampires*, which are known to bite animals and even men while they are asleep and suck blood from them, often so much that a burro, for example, becomes weak and wobbly.

In the islands south of Asia are found the large fruit bats, or *flying foxes* (Fig. 17, p. 17), which eat fruit and have an expanse of wing of thirty inches.

INSECT-EATING MAMMALS, OR INSECTIVORES

MOLES AND SHREWS

The moles. In the moles we find again the nicest adaptation of body and bodily organs to the work the animal does, and to its mode of food getting. The moles are miners. They dig underground for grubs, worms, beetles, and their larvae. In the stomach of one mole were found the remains of a hundred and seventy-one small white grubs; in another, two hundred and fifty ant puparia; in a third, ten cutworms.

The mole's body is exquisitely fashioned for its underground life, for its shape is cylindrical, and very pointed forward and aft. The forelegs are short, with the feet broadened to resemble small scoop shovels. At the ends of the toes are strong nails to protect them from wear. With this outfit the mole can fairly swim through loose soil. As one scrapes dough from a trough, so the mole with his shovel-like feet scrapes the earth aside and presses it solid with his cylindrical body. And as we would handle the scraper or spoon short, or right above the broad part, in order to have more power, so the legs of the mole are short. Indeed, they would be in the way if they were longer. Furthermore, he has no external ears, as they would be in the way also. He needs to catch no sound waves, for his whole body serves as a conductor of sound to the internal ear. (Stuff your ears with cotton, so that you cannot hear the ticking of a watch, then take the watch between your teeth.)

In the darkness underground the mole could not see even if his eyes were large, so he has eyes so small that

they are invisible in the thick fur. This fur is so thick and oily that water cannot penetrate to the skin.

If too much loose earth accumulates before him, the mole pokes with his head through the thin layer of earth above him and pushes the earth through the opening, thus making the so-called molehill. In this manner he becomes harmful to the farmer and gardener, and on lawns. When searching for grubs and worms underground he unintentionally uproots



After Schmeil

FIG. 18. *A mole that has found a white grub*

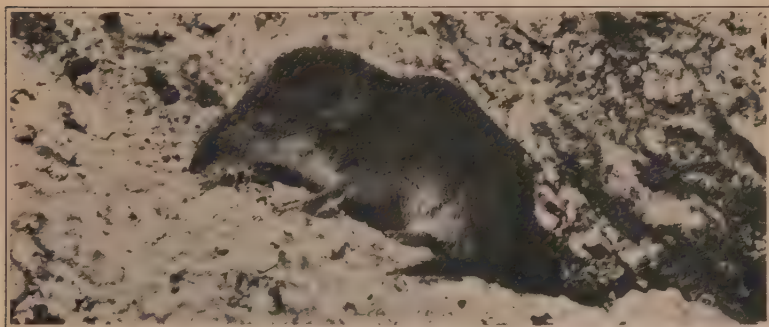
Note the position of the front leg

plants, which are killed thereby. His tunnels and hills make the lawn unsightly, and in consequence he is hunted and exterminated, although he is really an ally and friend of man in the warfare against noxious insects. That the mole does not eat plants, as some suppose, can readily be seen from his teeth, which are like those of the carnivores. His intestine is short also, as in all flesh eaters.

The common mole is about six and a half inches long, has a short naked tail, glossy silvery gray to velvety black fur, and is found in eastern North America from southern Canada to the Gulf and westward to the plains, where

rainfall becomes scant. Farther west, in the humid coast belt, in the fine forests of the Douglas fir, the *Oregon* or *Townsend's mole* is found, a larger and finer furred species.

In the eastern United States is found also the peculiar *star-nosed mole*, so called because he has a star-shaped growth of fine fleshy rays or filaments on his nose. This growth, as an organ of keen touch, seems to supplement the nose as an organ of smell. In April all varieties of moles



Photograph by W. E. Carlin; courtesy Doubleday, Page & Co.

FIG. 19. *A marsh shrew*

have from one to four young, which grow with wonderful rapidity, so that they are fully grown in May. The nest under one of those hills of earth is a mass of dry grass.

The shrews. In shrews we have the smallest of all mammals. The smallest one, the *common shrew*, is only three and a half inches long, tail and all. *Hoy's shrew*, of our northeastern states, measures only three inches, and one in Madagascar, only two and three-quarter inches. The common shrew is the most abundant mammal over large parts of its range, though it is rarely seen. It is found from the arctic tundras of Alaska to Illinois, and along the higher eastern and western mountains south to North

Carolina and New Mexico. The reason we do not see more of these animals is because of their small size, their vigilance, and the ease with which they can hide under a leaf or a piece of bark, under a log, in a hole, or in other ways. Most people take them for mice when they see them, but they are insectivores, not rodents, as can be seen from the absence of gnawing teeth. Furthermore, their heads are more pointed than those of mice. In German they are called *Spitzmaus*.

What the shrews lack in size, however, they more than make up in restlessness, appetite, courage, and pugnacity. Their runways are everywhere to be found in the woods, clearings, marshes, and farms. They are active day and night, summer and winter, always reconnoitering and hunting for food, which consists of grubs and insects, their pupae and larvae, and also of mice and other shrews. Yes, they are cannibals. When one shrew meets another it often means a fight to the death, the victor eating the victim. One shrew will often eat several times its own weight in a day.

Shrews are very useful to the farmer. It has been estimated that on a hundred-acre farm four shrews to the acre will dispose of about thirty-eight thousand, four hundred mice each year, or almost a thousand to a shrew. In winter the shrews rely on hibernating insects and their cocoons and pupae, of which they find a plentiful supply under logs and stumps, above and below ground. Their sight is poor, as is to be expected, but their scent keen. Their movable, pointed noses give them all the information they need. In summer they have several litters, each of from four to six young.

Another, the short-tailed shrew, is five inches long.

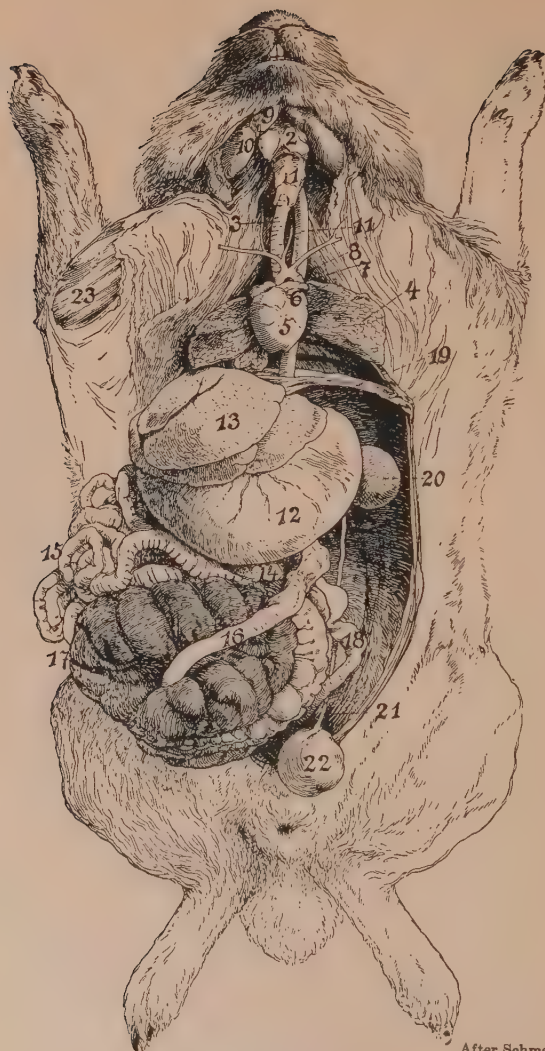
GNAWING MAMMALS, OR RODENTS

The rodents are by far the most numerous order of mammals, if not in species, at least in individuals. The only other order that may rival it in number of species is that of the hoofed mammals or ungulates, but even that is doubtful. While other once numerous animals, such as the bison, elk, wild turkey, and others, have entirely or nearly disappeared, the rodents are still with us in myriads. In fact, man tends to spread them and to introduce new kinds. We have the house mouse and the brown rat in the houses with us, where we do not want them.

Rodents are designed and built for gnawing. They may be recognized at once by their tools for gnawing, namely, two pairs of incisors, one pair in the front of each jaw, which meet vertically like chisels. There are no canine teeth, their place being vacant. Then come several flat-topped molars, usually four, in each jaw.

The incisors or gnawing teeth are of a peculiar structure. They are long, semicircular, and always keep on growing. Therefore the animal is compelled to use them to keep them worn down. Otherwise they would grow too long and prevent the mouth from being closed, thus causing the death of the animal. In order that there may always be a cutting edge to the incisors, they are covered with hard enamel in front, the rest being softer dentine and cement. Thus the rear of each incisor is worn down faster than the front, leaving the enamel standing like a keen-edged chisel.

Rodents vary in size from the beaver, which weighs up to seventy-five pounds, to the tiny harvest mouse, which probably weighs an ounce or two. They exhibit great



After Schmeil

FIG. 20. *Internal organs of a mammal (rabbit)*

1, larynx; 2, salivary gland; 3, windpipe; 4, lung; 5, ventricles of heart; 6, left auricle of heart; 7, pulmonary artery; 8, large artery from which branch those going to the head and arms; 9, lower jaw; 10, masticator muscle; 11, gullet; 12, stomach; 13, liver; 14, spleen; 15, small intestine; 16, appendix; 17, large intestine; 18, end of large intestine; 19, diaphragm; 20, kidney; 21, ureter; 22, bladder; 23, uncovered muscles of upper arm.

variety in life habits. Some are terrestrial, as the field mouse; others subterranean, as the pocket gopher; others arboreal, as the squirrels; some aquatic, as the muskrat and beaver; some even aërial to a degree, as the flying squirrel. But all have the two pairs of gnawing teeth. That is their "ear mark."

There are ten families to be recognized:

1. Rabbits and hares
2. Pikas
3. Porcupines
4. Pocket gophers
5. Pocket mice
6. Jumping mice
7. Rats and mice
8. Beavers
9. Sewellels
10. Squirrels and marmots

RABBITS AND HARES

The cottontail or gray rabbit. Poor Bunny! Here comes a crowd of boys, armed with sticks and accompanied by several dogs. They are after a little cottontail that has been living all summer among the shrubbery and in the gardens around my house. He comes bounding toward the house and pauses under a shrub, panting, full of fear. But the boys have again spied him. Up and away he goes, and they are after him with much shouting. Finally he runs across the street and into a hollow tree. However, the boys have heard or read about smoking out raccoons, so they try smoking out the little cottontail, and, sure enough, out he comes and is speedily dispatched.



Photograph by A. R. Dugmore; courtesy Doubleday, Page & Co.

FIG. 21. *Young cottontail among the cabbages*

This happens on the edge of Chicago, the great metropolis. Cottontails are still common there. The boys of a large school near by went out after the first snowfall of last year, armed only with sticks, and in the immediate vicinity killed about sixty gray rabbits or cottontails in two to three hours. Cottontails are still common in most places. Sometimes people in a small town will say, "I have not seen a rabbit for a long time," but if they would go out into their orchards they would see tracks in the snow leading to a brush pile, in which Bunny has his home. A few mornings ago the remains of one, evidently killed by a dog during the night, were lying on my front lawn.

Besides boys, dogs, cats, and hunters with guns and traps, the list of the enemies of the gray rabbit includes hawks, owls, skunks, mink, weasels, and foxes. Even some crows have found out that the cottontail is unable to defend



Courtesy Doubleday, Page & Co.

FIG. 22. *Nest of young cottontails*

This nest was in a hayfield. When found the young were covered with soft fur from the mother, so that they were hardly visible. This fur was removed in order that the little blind animals might be seen.

himself, and they attack him. How then is the cottontail enabled to hold his own—to remain among and near all these dangers and enemies that are formidable enough to have caused the disappearance of much stronger and more powerful beasts than he?

In the first place the gray rabbit is nocturnal; that is, he runs about and feeds mostly at night. In the daytime he stays under a brush pile or in a "form" hollowed out by his body in a dense tuft of clover or grass, or under a bush in the woods or clearing. Here one may almost step on him before he will jump up and bound away—sometimes giving one a scare.

Why is he not seen earlier? Because his color matches so well with the brown leaves and gray dead grass that

the eye does not perceive him. Therefore such coloring is called "protective coloration." In the case of the cottontail it is a mixture of brown, buff, tan, gray, and a little black, with white below.

But the eyes of the owl and hawk are sharp, the scent of the dog and fox is keen, and Bunny is often discovered. Then he relies on his speed, by which he often leaves his pursuers behind and escapes their evil designs on his life. If the hawk or dog keeps up with him, he will run zigzag, or will suddenly double on his tracks, so that the dog jumps over him, or use other ruses to get away from his pursuers. Alas, too often he is unsuccessful!

The cottontail's body is constructed in such a way as to enable him to be speedy. The hind legs are large and strong, the front ones are much smaller. Thus he is forced to jump, and jump he can, clearing many times his length at one bound. As eternal watchfulness is the price of his safety, he is equipped with large eyes. When he dozes in his form in the daytime he does not pull the lid over the eye, but only a translucent nictitating membrane, so that he can perceive a shadow flitting over him even when he is sleeping, and by a quick jump he can perhaps just get out of the way of a hawk or dog.

But all this does not explain the great number of cottontails in and around the haunts of man. There is yet another factor. That is their fecundity. They have several litters of from four to eight young in a year. The young are born naked and blind, either in a small hole in the ground or in a form among the clover and grass stalks. The mother covers them and lines the form with fur from her own body. Such great parental devotion to their offspring we find the rule among animals.

What is the food of the rabbit? This we can guess when we look at his teeth. The molars or chewing teeth are flat-topped, with enamel ridges across them. There are no canines or tearing teeth, therefore Bunny must be a vegetable eater. Furthermore, he has two pairs of long curved incisors in front, one pair in each jaw. These are constructed in such a way as to serve as highly efficient gnawing tools. They begin far back in the jaws and grow continually to make



FIG. 23. *Incisors of cottontail, and molars of right upper jaw*
B, an extra pair of small teeth that seems to be there merely to brace
or buttress the front pair

up for wear in front. The cottontail and all rodents are thus forced to gnaw to wear down their teeth. If nibbling off their plant food will not suffice to do this, they will simply gnaw at wood.

The food of the rabbits is clover, grass, and roots; also, if they can get them, turnips, cabbage, and other vegetables. In winter, if all this is covered with snow, they gnaw the bark of young trees and thus may do much harm. However, this they do only when other food is not to be had. Still, the cottontail should not be allowed to multiply too much. On the other hand, who would wish the jolly little fellow exterminated? The fields, clearings, and woodlands

would be far less attractive without that fluff of "cotton" bouncing up before you once in a while.¹

The cottontail, comprising several geographic races, is found from Florida to southern Canada and west to Minnesota. The one in northern Illinois, called the prairie cottontail (*Lepus floridanus mearnsi*), is seventeen inches long.

Other members of the rabbit family. From the northern United States into Canada, as far northward as there are woods, is found the *varying hare* or *snowshoe rabbit*, nineteen inches long. It is yellowish brown in summer but entirely white in winter, a case of seasonal change of protective coloration. Thus in summer the hare is almost invisible in the brown of the swampy woods or beds of dead arborvitae leaves where it lives, and in winter it is likewise invisible in the snow. Moreover, its feet in winter are provided with broad brushes or pads of hair which make them broader and thus less likely to sink into the snow.

When the settlers first came into our northern states these hares were rapidly exterminated, because they have the fatal habit of making a few bounds and then stopping to look at the intruder, whose gun would usually put an end to the hare's curiosity. Still farther north is the *polar* or *arctic hare*, about twenty-three inches long. This species remains white throughout the year, for in its far northern habitat patches of snow remain throughout the summer.

Adjoining the range of the cottontail on the west, and overlapping it over wide areas, is the range of the *jack rabbit*, a typical long-legged hare, not a rabbit.² The jack rabbit is a big fellow, twenty-five to twenty-eight inches

¹Read Harris' *Bre'er Rabbit*.

²The popular names of animals are often incorrect and misleading. We have no true rabbit at all in America. The true rabbits of the Old World are gregarious and burrowing rodents, while none of our species burrow. Ours, however, are similar both to the European rabbit and to the hare.

long, much like the European hare.¹ It is found from Kansas to Saskatchewan, and from Minnesota and Iowa to the Sierra Nevadas. Where there is snow in winter, it becomes white in winter; otherwise it remains brown. It is famous for the enormous jumps it can make, easily clearing ten, fifteen, or even twenty feet at a bound.

In the southern states we have the *marsh hare*, about eighteen inches long, and the *water hare*, twenty-one inches long, both of which are expert swimmers. Our cottontail can swim also, as indeed can all mammals, but he does not like to go into the water. These southern hares are as much at home in the water as on land.



FIG. 24. A jack rabbit in winter

Here are the differences between hares and rabbits:

HARES

Ears longer than head
Live above ground
Young born with eyes open
Solitary
Hind legs longer than head

RABBITS (Europe)

Ears not longer than head
Live below ground
Young born with eyes closed
Gregarious
Hind legs not longer than head

PIKAS

The pika, or little chief hare. Anyone climbing our western mountains will soon see among the extensive rock slides, between eight thousand and thirteen thousand feet altitude, a little animal that seems to be part rabbit, part

¹ This hare has lately been introduced into Ontario, Canada, and the chances are that it may spread into our adjoining states.



Photograph by W. E. Carlin; courtesy Doubleday, Page & Co.

FIG. 25. A pika, or little chief hare

rat. On noticing the intruder, one or more of the little fellows will at once utter a shrill cry or bleating call, and they will all scurry away into the many crevices between the rocks and not be seen for a long time. This is the pika, also called *cony*, or *little chief hare*, only seven inches long. It is brown in color, excepting the large, broad ears, which are margined with white. It has no tail whatever.

Although the pika lives so high up in the mountains, where it is very cold in winter, it is active during that inclement season. But it provides in summer for the hard winter. Near its dens and burrows you will notice little stacks of piled-up grass and weed stems. It is found in all of our western mountains, from Mount McKinley to northern New Mexico. The "coney" mentioned in the Bible is an entirely different animal, the hyrax, which is counted in with the hoofed mammals.

PORCUPINES

The porcupine. Most rodents or gnawing mammals are swift of foot, as witness the cottontail, mice, rats, and squirrels. But the porcupine is different. It is slow, something like the sloth of South America. A person walking briskly can keep up with one running at full speed. Imagine the cottontail as slow! If he were, would there be any cottontails left?

Why then is the porcupine still rather common in the north woods? Because it has a defensive armor which commands universal respect among animals, a coat of sharp spines or quills. When a porcupine is overtaken by a man or an animal he will arch his back, thus making his body round like a ball, and will erect all his spines. These spines are sharply pointed, and loosen easily from the skin. At the end they have tiny barbs which penetrate the skin readily enough but do not pull out so well. The tail of the porcupine is the only active part of the animal. If an animal gets within reach of that tail, one slap from it will cause the attacker to withdraw with a howl of pain. Nor is that the end. Because of the barbules near their tips, the spines will not come out unless forcibly pulled out, but will gradually work their way into the body of the animal, perhaps into some vital organ, thus avenging the porcupine by killing its enemy possibly weeks after the attack took place. The northern fisher and the otter sometimes skillfully roll a porcupine over and attack and kill him from below, where there are no spines.

A great horned owl once brought to me had fifty-four spines or parts of them in its body—in the breast, face, eyelids, underside of wings, and feet. In the darkness of the night it probably had mistaken the porcupine for a

muskrat or woodchuck and attacked it, but a slap from the tail had sent the owl away full of spines.

What is the food of the porcupine? Since it is a rodent



Photograph by A. R. Dugmore
Courtesy Doubleday, Page & Co.

FIG. 26. *Porcupine with quills
thrown forward*

it is bound to gnaw, and this it does with a will. Once, when standing in a clump or thicket of spruce trees in Canada, I heard a queer noise, a sort of scraping or rasping sound. Looking around in all directions to find the origin of the strange sounds, I finally discovered a porcupine in one of the trees near by, about twenty feet up. It was gnawing off the bark of the tree. That is the food of the porcupine. It prefers aspen, cherry, birch, spruce, and pine. For dessert it sometimes eats the old, dry

shingles on a deserted cabin or summer lodge, and if it gets into a garden it works havoc among the vegetables.

The color of the porcupine is black, mixed with some dark brown among the hair. The quills are tipped with white. The porcupine is a solitary animal, and does not enjoy company even of its own kind. The pairs live in small hollows between rocks or in hollow trees, where from two to four young are born early in the spring. The young are somewhat spiny even at birth, and they are large and unattractive. They are soon left to shift for themselves.

There is a small spiny animal in Europe called the *hedgehog*. This animal must not be confused with the porcupine, for it belongs to the insectivores and not to the rodents. It is only about twelve inches long, whereas the porcupine is twenty-eight inches long.

In Africa, too, there is a porcupine having spines twelve to sixteen inches long, whereas ours have spines only from two to five inches in length.

POCKET GOPHERS

The pocket gopher. The color of the pocket gopher is cinnamon brown, paler in the western states, with a blackish line along the back and dull yellowish below. The tail is almost naked. It is ten inches long. Its range is from Florida and Georgia westward and northwest to Illinois, Minnesota, and Saskatchewan, and south to California and Panama.

This little animal is harmful out of all proportion to its size. It excavates an elaborate network of burrows or tunnels underground. If the galleries of one gopher were put end to end they would total a mile or more. Along the tunnels there are small side excavations which are the larders. Here the gophers carry considerable stores of grain, seeds, fruit, tubers, and the like. They also gnaw at the roots of trees and of corn and other plants of field or garden. They gnaw into and thus spoil fallen fruit, such as oranges. More sinister still, they carry fleas which harbor the microbes of such epidemics as bubonic plague, cholera, and spotted fever. Therefore federal, state, and county authorities wage a determined fight of extermination against them, and their numbers are melting away rapidly where they once were abundant.



Photograph by W. E. Carlin; courtesy Doubleday, Page & Co.

FIG. 27. *Western pocket gopher*

Note its molelike build, big hands, and short ears, all adapted for an underground, burrowing life. Photographed after his pursuers had dug sixty-seven feet along his tunnel in order to catch up with him.

In spite of this we have to admire the nicety with which the gopher is adapted to its mode of life. So that it can bore through the earth, its body is strongly built in front, with a thick head and stout neck. External ears are almost absent, as they would only be in the way. The front legs are stronger and larger than the hind ones. To remove the dirt from the burrows and to carry provisions into its many little pantries the gopher has two external cheek pouches, which open into the cheeks from below. To fill these they use the front feet like hands, as the squirrels do.

The striped ground squirrel which in Illinois and elsewhere is often called a gopher, is not a true gopher, since it has no outside cheek pouches.

POCKET MICE

The pocket mice. The pocket mice are rather handsome, soft-coated little creatures. They would be counted in with the rats and mice were it not for the outside cheek pouches they have, much like the pocket gophers. Here belong *Ord's kangaroo rat* of our southwestern states, which, true to its name, can make surprising leaps, and the *banded pocket mouse* of the prairie provinces of Canada. In their leaping abilities they resemble the next family, the jumping mice.

JUMPING MICE

The jumping mouse. If you ever come across a pretty little reddish brown mouse with white feet that takes big jumps in trying to get away from you, it is the meadow jumping mouse. It makes leaps of from one to ten feet, although it is only eight to nine inches long, tail and all.

RATS AND MICE

The muskrat. In 1914, the year of the last great fur auction in London, more than ten million muskrat skins were sold. This shows that the muskrat is by far the most important fur animal in the world. What if the fur of the seal or beaver or silver fox is ever so much finer and costlier? By their great number the muskrats more than offset the difference in the price of a single pelt. While animals such as the beaver, otter, marten, seal, and others have retreated before the advance of man, even to extermination over large parts of their former range, the muskrat serenely holds its own, sometimes living in the rivers and creeks right in our towns.

How do they escape extermination? By their fecundity. They have from three to thirteen young in each litter two or three times a year. Also, their mode of life aids them in escaping annihilation. They inhabit rivers, ponds, lakes, and cat-tail marshes from the Gulf of Mexico to Labrador and Alaska. A small cat-tail area in the widened part of a river, or at the end of a lake, is large enough to harbor



FIG. 28. *A muskrat busily at work cutting a stick in two*

a pair or two. Here they build round-domed houses of cat-tail, sod, and the roots of water plants. The entrance is below water, so they can come and go without being seen. Inside the house is a floor above the water, and here the young are born. They are at first naked and blind.

The well-worn paths leading to and from their houses can be seen on the bottom of the marsh or river. Then, too, the round cat-tail houses are easily seen, and the trappers are not slow in putting their traps, artfully concealed, into the runways. Therefore the muskrats have learned another way of home building, which does not so clearly advertise their presence. In many parts of their range they make burrows in the banks, with several entrances, both above and below the water line. Thus they can live on a river in the middle of a town without being detected. Their foraging is usually done at night, their food being water plants and their seeds, bulbs, and

tubers. But they also eat the eggs and young of marsh-nesting birds. They often do great harm by weakening dams and levees with their burrows, so that these give way at high water.

The muskrat is about twenty-four inches long, of which eight inches are tail. The tail is nearly naked, scaly, and flattened sidewise. Let us hope that this lively and chubby denizen of the marsh and river will always retain his place in our great outdoors!

The field or meadow mouse. When going over our meadows or prairies in the spring after the snow has disappeared, or in the fall after the rank grass has been cut down by frost, we notice many small runways through the dry grass, and here and there a little grass cushion, worn round by a small animal. These are the runways and nests of the field or meadow mouse, which is a near relative of the muskrat, although it is only six or seven inches long, of which two inches are tail. The body is covered with black or dark gray hair. Several litters of young a year furnish new supplies, and these would soon overrun our fields and orchards, doing enormous damage, if the increase in their numbers were not checked by their many enemies—the mink, weasel, snake, shrew, opossum, and especially the hawk and owl. In this way the last-named birds are useful friends to the farmer, and he should protect, not shoot, them.

The white-footed or deer mouse. This is the prettiest of our mice. It has soft, velvety, light brown fur, somewhat like that of the flying squirrel, and large ears and eyes. The underside of the body and the feet are white. The deer mouse lives in the woods and clearings, where it is active even in winter. It has inside cheek pouches, which it uses to carry grain, seeds, and nutlets into its hoarding



Photograph by A. R. Dugmore; courtesy Doubleday, Page & Co.

FIG. 29. *A white-footed mouse and her young*

Photographed March 13th, at South Orange, N. J. The nest was in an old woodpecker's excavation in an apple tree. Mr. Dugmore ran a mile to restore the mother to her children, she having run into his pocket when frightened by his approach, and found there later.

places. The nests of the deer mice are in stumps or logs, or under the bark of trees, often ten to twenty feet up. They often roof over a bird's nest in a bush with leaves and then use it during the winter and sometimes even for nesting quarters.

Like all mice and rats, the deer mouse has several litters of young from April to October. The more acorns in a year, the more deer mice, and consequently the more owls, because mice are their preferred food. The deer mouse can sing a little ditty in a high-pitched voice.

The house mouse. This well-known pest is not a native of North America, but it came over with the first settlers in 1607 and 1620—hence it belongs to the “first families” in the land. Nobody wants it, but still it is sharing our houses with us. Its small size and quickness are its protection. Perhaps you do not know that it, too, is able to sing in an extremely high-pitched voice, but it rarely does so within the hearing of man.

The Norway or brown rat. The brown rat is probably the most harmful and the most dangerous animal in existence. Like the Huns of old, this destructive pest originally came from Asia, arriving about 1730 in Europe. It appeared first in Russia, from whence it spread to Germany, Norway, England, and the rest of Europe. From there it was brought on ships to America. The food habits of this rodent, its destructiveness and extensive gnawing, coupled with its fecundity, make it a national danger. These rats are perhaps the most prolific of all mammals. They breed five or six times a year, and in favorable places and seasons even oftener, each litter numbering from six to seventeen young, which in turn are able to breed when from four to six months old. The Department of Agriculture at Washington reports that fifty rats on a farm cost the owner from one hundred to three hundred dollars a year. It has been said that whoever makes two blades of grass grow where there was one before is a public benefactor. A modern version would be, that whoever kills one rat where there would otherwise be two tomorrow, is a public benefactor. As we ought to swat the fly, another dangerous animal, so let us swat the rat, for besides the many millions of dollars of damage it does by destroying food and buildings, it carries diseases such as cholera and bubonic plague. Before the Norway or wharf rat, as it is also sometimes called, the *roof rat* and the *black*



After Schmeil
FIG. 30. *House mice climbing on sack*

Note how the lower animal uses tail as prop

rat had been introduced here from Europe. They are smaller and less voracious than the brown rat, also more timid and a little better looking, the black rat having a rather pretty black velvety coat. But when the Norway rat came it promptly killed and ate all the black and roof rats which it found in the haunts that were to its liking. The roof rat in the South, introduced from Egypt, is better able to hold its own, as it lives in the uppermost parts of houses, while the brown rat prefers lower levels.



After Schmeil

FIG. 31. *A Norway rat killing a black rat*

Besides the ones described, there are many more mice and rats in North America, such as the *pine*, *red-backed*, *beach*, *grasshopper*, and *harvest mice*, the *wood rat* of the West, and the *cotton rat* of the South.

BEAVERS

The beaver. The beaver is one of the most interesting of animals. It has traits and abilities, such as diligence and resourcefulness, that must command our admiration. It is justly called the architect among animals. Let us try to understand the problems that confront the beaver and are solved by it, and we shall be sure to admire it.



Photographs by A. R. Dugmore; courtesy Doubleday, Page & Co

FIG. 32. *Beaver lodges and a beaver dam*



Courtesy Field Museum

FIG. 33. *Beavers and their work in northern Michigan*

The beaver is an aquatic and nocturnal animal. It builds round-topped or domed houses or lodges like the muskrat, only they are much larger, since the beaver is several times larger and heavier than the muskrat. Therefore the usual cat-tail swamp does not contain enough water for it. The beaver is also much more shy and wary than the muskrat. It does not want to be seen and observed. If it should build its large lodges in the deep water of a river, they would be easily seen and would, moreover, be easily washed out by freshets or high water in the river. What does the beaver do to insure safety to his home as well as a proper depth of quiet water?

A troop of young beavers, having been given to understand by their elders that it is time to leave the parental colony and to start a new one somewhere else, is looking for a site for a prospective beaver settlement. They shun the presence of man, but follow the paths of the wilderness, and go, preferably, to some mountain solitude. Here they look for a creek meandering peacefully through a quiet, secluded valley, and lined with dense stands of poplar, alder, birch, spruce, and other trees. The creek is not roomy enough for several lodges, and too, these might be swept away by the first flood. Therefore the beavers build a dam at a place where higher ground comes near the creek, closing off at one end a small flood plain along the banks of the creek.

After having located the proper place for their dam, they set to work to fell trees for building material. They first choose the trees nearest the creek. With their large, powerful incisors, they girdle these trees in two places a foot or two above ground (Fig. 34, p. 46). The grooves they make are three to four inches apart. The wood is then torn or gouged out between the deep grooves, till the tree topples

over, usually toward the creek, as the trees on the bank naturally lean toward the creek or river.

As a rule small trees of from four to eight or ten inches in thickness are selected, though trees as large as four feet through are on record as having been cut down. A cottonwood of seven inches, at which beavers began to gnaw at seven o'clock in the evening, fell at three o'clock in the

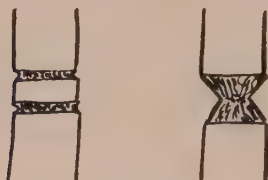


FIG. 34. *Showing how the beavers girdle trees*

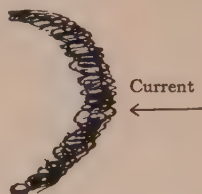


FIG. 35. *Showing shape of beaver dam*

morning; one of five inches fell in one and a quarter hours. The trees are then cut into short lengths of from two to three feet, dragged to the creek, rolled in, and floated by the animal to the site of the dam. At the same time pieces of sod and root material are carried between the forelegs, not on the broad tail as has been supposed. The short log is taken to the bottom of the creek and laid down endwise to the current. The earth, stone, or sod is put on to weight it down and keep it in place. This is done until the dam comes to the surface of the creek and as much higher as they want it to be. In this way dams six hundred feet long, six to nine feet high, thirteen to twenty feet through at the base, and six feet wide at the top have been built, although most dams are much smaller. Nor is the dam built straight across the creek, but somewhat semicircular in form, with the convex side toward the current, so that the current is divided and cannot exert its entire force against the center of the dam at times of high water (Fig. 35).

By this means the water of the creek is backed up and overflows the adjoining low land to a depth of several feet. In this flooded place the beavers can then build their lodges of branches, sod, roots, and plant stems. The entrance to the lodge is below water, but the floor inside is above the water line. Here from two to five young are born at a time.



FIG. 36. A beaver's hand and foot
1, left hand; 2, left foot

The beaver is also beautifully adapted in structure to its mode of living. The body is spindle shaped; the ears are small, so as to offer the least possible resistance to the water; the hind feet are broadly webbed (Fig. 36). The flat, naked tail serves as a rudder to steer the animal up or down. It is also used to give danger signals, for when a beaver notices any danger he slaps his tail on the water, whereupon all disappear. Beavers seem to mate for life. Their calls or noises are the following: a low whistle, a mournful sound like that of a porcupine, a low murmur at mating time.

The beaver is the largest of our rodents, attaining a length of forty-four inches and a weight of from thirty to forty pounds.¹ This interesting animal has been nearly

¹ Mearns, in his *Mammals of the Mexican Boundary States*, states that the broad-tailed or Sonoran beaver of Arizona reaches a weight of seventy-five pounds—a truly gigantic beaver.

exterminated. Its fine brown pelt is too valuable to allow the greed of man to let any live. A few are still found in



Photograph by A. G. Eldredge

FIG. 37. *A beaver dam on Spearfish River in the Black Hills of South Dakota*

the southern Appalachian Mountains, in the Southwest, and in the northwestern states. The bulk of the species, however, is in Canada, where they are more rigidly protected than with us. When shall we stop spoiling and killing and exterminating, and instead take a kindly and intelligent interest in all animal life?

The sewellel, or mountain beaver. The mountain beaver is a little-known animal living away from the haunts of men along the streams of the Cascade Mountains, in eastern Oregon and Washington, in British Columbia, and in northern

California. It looks like a tailless muskrat, but its fur is coarser. It lives in extensive burrows, through some of which water runs, with a nest chamber two feet underground and eighteen inches in diameter. The sewellel has a note something like that of a screech owl and another lower one, a booming sound, which causes it to be called also the "boomer." The mountain beaver fells saplings and cuts down stems of bushes, which it cuts up into short lengths and piles up something like cordwood. If it gets into fields or gardens it does much damage. Its build is especially adapted to its digging activities, and it is a stout and strong animal.

SQUIRRELS AND MARMOTS

The squirrels. To see and observe squirrels, those harlequins among our wood folk, one must now go into our parks rather than into the woods. They have been, and are, so persistently hunted that they are almost exterminated over large areas in their legitimate range. And this has happened in spite of the fact that they are a great attraction, a source of interest and amusement in the woods. While true sport holds a lawful and even useful place in the life of the nation, real sportsmen are as a rule lovers and protectors of nature. The indiscriminate "toting" of guns by boys and others not known for their high ideals of citizenship is rapidly becoming a calamity and a menace to the nation. This wholesale licensing to carry guns and kill ought to stop before our woods and fields are silent and lifeless, and therefore dull and uninteresting. If you *must* hunt, hunt with the camera. That is more satisfying, as you get more lasting trophies in your pictures, to get which you must use more skill, patience, and endurance than to

get an animal with rifle or shotgun, besides getting all the fresh air and exercise you want.

Observe the sprightly, nimble, graceful, and pretty squirrels in our parks—since they are gone from many of the woods, where they rightly belong. Squirrels in parks realize that they are protected and allow closer approach than they will in the woods. Here one is racing with or chasing another over the grass and up a tree. Notice how they always keep the tree between you and them! But they are also very curious. They will peep around the side to see what the observer looks like. Here is another sitting on its haunches, munching at a nut thrown to it by a passer-by. Here one is jamming his mouth full of leaves that are to go into the making of the winter nest high up in a tree. There one is hiding an acorn under the grass or in some nook for use later on in the cold, stormy days of winter. When sitting up, using their front feet as hands, and holding their bushy tail gracefully curved and parallel with the back, they look charming indeed. In the Chicago parks one may see the gray and fox squirrels clambering over the people sitting on the park benches, and searching their pockets for nuts. The people who regularly come to feed them are known to the squirrels as their friends. This would also be true in the woods, to some extent, if the animals were treated with kindness, and not greeted with rifle and shotgun.

Squirrels are agile climbers and fearless jumpers. With their sharp little claws they can run up a tree as though it were level ground. In their long jumps from one tree to another their long bushy tails no doubt act as a balance. The squirrels live in hollow trees, but for the winter many make a nest out of leaves and twigs anchored among the branches of a tree. In this leafy nest the family huddles

together when the chill blasts of the north wind roar through the woods, and thus keep each other warm. They have one or two litters of young a year, depending on the kind of year. If the year is favorable—that is, if there is much food for them—they have two litters of five or six each; but

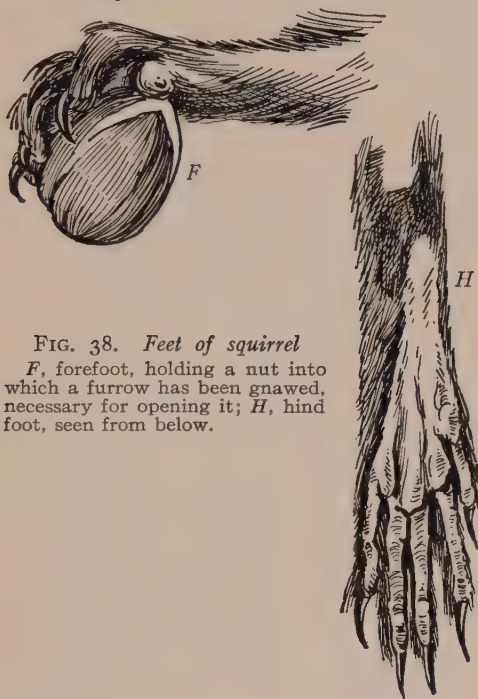


FIG. 38. *Feet of squirrel*

F, forefoot, holding a nut into which a furrow has been gnawed, necessary for opening it; *H*, hind foot, seen from below.

if it is a poor year, they have but one litter and fewer in the litter. The food of the squirrels is the so-called mast of the forest—that is, acorns, beechnuts, and other nuts, as well as berries, mushrooms, and roots. Unfortunately, they also eat the eggs and even the young of birds, so it is poor policy to have too many in a park or village. If one wants birds, the number of the squirrels must be kept down.

Our largest squirrel, but at the same time the least hardy, is the *fox squirrel*. It is so called from its color, which is yellowish gray or grizzly on the back with rusty red under the tail. In the East the under parts are yellowish brown,



FIG. 39. *Skull and jaw of squirrel*

1, skull of squirrel; 2, palate or inside of upper jaw; the fifth molar has dropped out, as is common with them; 3, lower jaw, enlarged to double the size of the upper figures. The dotted line shows the extent of incisor in jaw.

but in the western part of its range they are a dark rusty brown, and sometimes even black. The fox squirrel is twenty-four inches long, tail and all, and is found from Florida and Louisiana to central New York and South Dakota, but not in Canada, or at least not far beyond the



Photograph by A. R. Dugmore; courtesy Doubleday, Page & Co.

FIG. 40. *Young red squirrel*

United States border. It thrives best in the South. The squirrel hunters of the Cumberland and Great Smoky mountains are well known for their deadly aim.

In the same range, but extending some distance farther north, is the *gray squirrel*, which is eighteen inches long. It is of a fine gray color, especially in winter, but in summer sometimes a little rusty on its back and whitish below. The gray squirrel is more destructive to birds than the fox squirrel. The *black squirrel* is a color phase of the gray, not, as some think, a distinct species.

Still smaller than the gray squirrel, but more mischievous and more destructive to bird life, is the *red squirrel*, or *chickaree*. When passing through a wood where they are, you will soon see one on the trunk of a tree, usually head downward, making a lot of noise which seems to be part sneeze, part cough, and part bird note. It seems to be a

protest and a scolding. The little fellow sometimes works himself into a regular frenzy. He is the most active one of the family, fairly racing from tree to tree. He seems to delight in teasing birds and destroying their eggs and young. Furthermore, the red squirrels eat the pine seed found in the woods which they inhabit and thus prevent the natural reforestation which is so necessary when our lumbermen have turned the pine forests of former years into a melancholy waste. Therefore their number ought to be kept down. They are pretty little fellows, a bright, glossy chestnut brown above, olive gray on the sides, and white below. When they make leaf nests, these are lower down than those made by the two preceding species. The red squirrel is only about twelve inches long, but what an amount of energy, activity, rollicking good humor, mischievousness, and curiosity about the affairs of others is pent up in that little body!

The red squirrel is found from about latitude thirty-five degrees to Labrador and Alaska. When it is severely cold and stormy, squirrels stay in their nests, but the first mild day brings them out. They do not hibernate in the strict sense of the word.

Our smallest and most delicate looking squirrel is the *flying squirrel*. It is only nine to ten inches long, and it has soft, thick fur of a drab or tan color, with pure white on the underside. It has large black eyes, proportionately larger than those of the other squirrels. This is because its mode of life requires it to see better, which means that it is nocturnal.

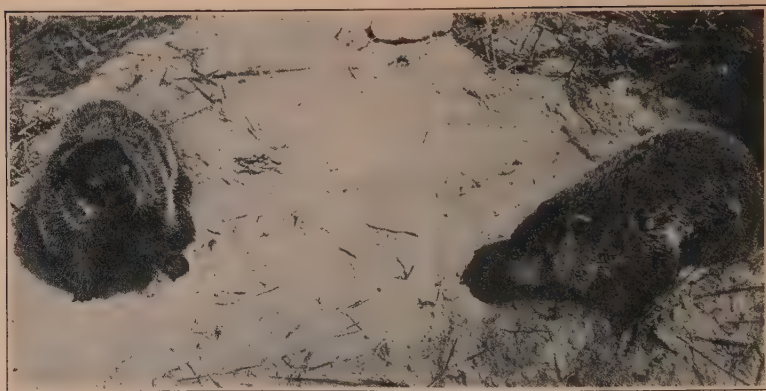
In the daytime the flying squirrels remain in their holes in trees, but as darkness comes on they become lively, and one after another of the family ventures out. They spread



Photograph by W. E. Carlin; courtesy Doubleday, Page & Co.

FIG. 41. *Flying squirrel*

the legs, and the skin which is between the fore and hind legs allows them to glide downward in a slanting course or flight. They cannot fly like bats, nor can they reach a place higher than the one from which they started.



Photograph by A. R. Dugmore; courtesy Doubleday, Page & Co.

FIG. 42. *A pair of woodchucks near their burrow*

Although the flying squirrel is found northward to beyond the arctic circle, it does not strictly hibernate; its heavy coat of fur evidently enables it to stand the cold and even to leave the nest from time to time to get its hoarded food.

Note the peculiar distribution of the squirrels. The largest is the least hardy and remains farthest south. The next smallest goes farther north. Still farther north is the red squirrel, while the small and tender flying squirrel goes farthest north of all.

The woodchuck, or groundhog. If the woodchuck had some of the vivacity, restlessness, and mischievousness of the red squirrel, it could well be called the clown among our animals. It certainly has the figure and face for it. Watch it as it sits or stands on a stone wall or on a rock or a small mound of earth near its burrow, taking a sun bath. Its face and body are so fat and plump that that alone is droll enough without anything further being added. I once came upon two groundhogs in the woods that for some reason had failed to notice my approach. When they saw

me almost upon them they fled precipitately, almost overturning their short fat bodies, and at the same time they made a gurgling sound as though they were water bags in commotion. It was most ludicrous.

Woodchucks as a rule do not venture far from their holes, but when they do so they can easily be overtaken and speedily dispatched by a dog, unless they are near a tree, which they will occasionally ascend when hard pressed, usually only high enough to be out of the way of dogs, but sometimes as high as forty feet.

The groundhog is found from Georgia and New Mexico to Labrador and Alaska, and beyond the arctic circle. In some parts of its range it seems to prefer the sunny edge of a clearing in the woods. In other parts it is found away from the woods in pastures, fields, or on river banks. It is common in the sand dunes of northwestern Indiana.

Looking at its rotund, heavy-set body, one would not think the woodchuck belonged to the family of squirrels. But it does. This is determined by the skeleton, especially the skull, which is that of the squirrel, only larger. The woodchuck is twenty-four inches long, with a short tail and short legs. The skin is thick. The color is a grayish yellow or grizzly, with black feet, and rusty brown on the underside of the body. It is a close relative of the marmot found in our western mountains and in the Alps of Europe.

As a rodent its food is vegetal, such as clover, grass, and garden vegetables. For this reason, and for the added one that their holes may prove dangerous to horses and cattle, groundhogs are not exactly a desirable addition to the farm. Yet who would like to miss the droll, fat, philosophical woodchuck from our countryside?

The burrows of the groundhogs are from six to forty-five feet in length, and the home or nest, where they stay and where the young are born in April, is three or four feet



FIG. 43. *A prairie dog*



FIG. 44. *A woodchuck or groundhog*

below the surface of the ground. Here they also hibernate—that is, they retire in September or October, roll themselves up, and sleep so soundly that they seem to be dead. They are in a torpor, and their bodies are rigid. But when the sun begins to come northward after its sojourn over the tropic of Capricorn, and its beams become warmer, our underground philosopher wakes up, comes out of his hole, and looks about to see how the prospects are for an early season. Thus there is a little truth to the groundhog-day story of the second of February.

The prairie dog. Unlike the woodchuck, which seems to detest companionship and sociability, the prairie dog is highly sociable. “The more, the merrier” seems to be his slogan. Prairie dogs live in colonies called “dog towns,” the population of which sometimes numbers thousands. Indeed, in western Texas there is, or was, a tract two hundred and fifty miles long covered with the burrows and mounds of these.

little fellows. For, like the woodchuck, they make burrows, heaping the earth or gravel excavated from the burrows into a small mound at the entrance. Here they often lie, sit, or stand upright, according to circumstances. From here they whistle and "talk" to each other; from here they make visits to one another, or forage in the adjoining grass; and from here they dive into their burrows at the first sign of danger, for like all rodents they have many enemies, such as hawks, eagles, owls, mink, weasels, foxes, coyotes, wolves, skunks, and pine or bull snakes. But, like all the rodents, the prairie dogs are also highly curious. No sooner have they disappeared than their noses and their bright beady eyes appear again at the mouth of the burrows to see what it really was that caused the commotion.

A determined warfare is now waged against these droll little fellows, because they destroy much grass that might be fed to cattle or horses. Furthermore, in their pelage they harbor fleas, which in turn carry the microbes of such a dread disease as spotted fever. This war is waged by federal and state governments, county and township authorities, usually with poisoned grain which kills them by the thousand. The prairie dog is now exterminated over wide areas where it was formerly numerous.

The story that burrowing owls, rattlesnakes, and prairie dogs live peacefully side by side in the same burrow seems to be a fairy tale, like much that is popularly believed about animals, especially snakes. If the rattlesnake goes into a burrow, it does so from no feeling of friendship, but probably because it is looking for a meal of young prairie dog. The same is true of the burrowing owl.

The length of the prairie dog is fifteen inches. In color it is tawny or yellowish brown, with some gray and black

hairs, and dirty white below. The ears and tail are short, the latter not bushy as in squirrels. Its range is from western Texas and Kansas westward to the Rockies and northward to Montana.

The striped spermophile, or ground squirrel. The ground squirrel, a dapper little inhabitant of our prairies, is usually called "gopher." But it is not a gopher, since it has no outside cheek pouches, but only inside ones, as have other rodents. It greatly resembles a squirrel, except that it is found in the open prairie and has a smaller and less bushy tail.

The spermophile has a unique color pattern. On a ground color of yellowish buff run thirteen stripes along the sides and on the back; these are dark brown, but in them are numerous small yellowish-whitish dots. One might think such a pattern would advertise its presence by making it more visible, but such is not the case. On the contrary, such a broken pattern also breaks up the outline of the animal for the eye, and it is not easily seen unless it moves. When it sees anything suspicious approaching—a man, for instance—it will rear up to its full length and remain perfectly rigid, and thus for all the world look like a piece of root sticking up from the ground. That is called "protective posture."

The spermophile is very destructive to gardens and fields. I once saw one in my garden reaching up along a cornstalk for the lowest cob. It stretched itself so long that it looked like a snake. Any vegetable food seems to the ground squirrel's liking. It does not store up food like the squirrels, because it hibernates, and hibernators need no food during the winter. The spermophile hibernates from October or November until March or April, depending on the locality,



FIG. 45. *Thirteen-lined spermophile* or "gopher" on left; *Franklin's spermophile* above; *chipmunk* below

as it is found from Texas to Saskatchewan and Alberta. It has one litter in the spring of from five to thirteen young.

Ground squirrels are eleven inches long, of which three and a half inches are tail. Their greatest enemy is the red-tailed hawk, which prefers spermophiles to anything else. On its nests may always be found remains of spermophiles if they are at all obtainable. As a reward for this useful service the hawks are shot down by farmers and city hunters alike. It is about time we learn to distinguish our friends from our foes.

From northwestern Indiana to Saskatchewan is found *Franklin's ground squirrel* or *spermophile*. It is decidedly larger than the striped spermophile, being fourteen inches long, of which four and a half inches are tail. The tail is also bushier than that of the striped species. This spermophile is yellowish brown above, becoming grayish blue on the head, and everywhere finely peppered with black.

Below it is yellowish white. It prefers to be nearer to underbrush than its striped cousin, otherwise they have



Photograph by C. F. Gronemann

FIG. 46. *A chipmunk*

much in common, such as the inside cheek pouches and the hibernating habit.

From northeastern South Dakota northwestward to the foothills of the Rockies in Alberta is found *Richardson's ground squirrel* or *spermophile*. It is also called "flickertail," from its habit

of nervously flicking its tail when one approaches it. It is smaller than Franklin's, being twelve inches long and more decidedly yellow. It hibernates for about eight months of the year, probably the longest hibernation of any mammal.

Still farther west are the *white-tailed* and the *Columbia spermophiles*.

The chipmunk, or ground hackee. What country boy does not know this pretty, nimble little creature? Even most city boys know it, at least such as take strolls out into the country or go out camping in summer, as all city boys should. Where the old-fashioned snake or rail fences are still found, a chipmunk can often be seen running along one of the rails until it gets to its hole in the ground, into which it disappears. It prefers to live along the edge of woods, in or near clearings, and especially along old rail fences overgrown with brambles. Here it is a close neighbor of the bobwhite.

The chipmunk does not betray its burrow by any earth piled up before it, as does the prairie dog, but either carries the earth some distance from the excavation or pushes it out at one opening, which is then closed up, and uses only

the others, where there is no excavated dirt. The entrance, measuring about two inches across, is often at the foot of a tree or under a root. In small side galleries the chipmunks store up nuts and seeds, sometimes in considerable quantities. They hibernate, but perhaps wake up once in a while for lunch, when the stored-up supplies are very acceptable to them. In the burrow is also the nesting chamber, where their four to six young are born once or twice a year, depending on the food supply. This also regulates their presence or absence in a locality. In some places there are many of them, while in others, seemingly as good, no chipmunks are found. Sometimes all seem to disappear from a certain locality, not to reappear again for a year or more. Every year they seem to disappear in July and to be back again in August.

Ernest Thompson Seton,¹ whose animal books should be read by every boy and girl, says of the chipmunk: "The regularity with which the chipmunks appear, with the first soft wind of spring, sets me wondering sometimes whether there is not more than mere verbiage in the phrase, 'vernal influence.' Snug in their deep, dark abode, far beyond reach of sun or frost, they cannot be reached by mere temperature, nor can it be that they appear at a set time, as some of our winter-sleepers are said to do. No! They must come forth on the very day when first the very spring is in the land. A chipmunk announces its return to sunlight in a manner worthy of a bird. Mounted on some log or root it reiterates a loud chirpy 'chuck-chuck-chuck.'"

Other chipmunks run from their holes, for they awaken almost in a body, and coming forth into the sunlight, they seek some perch and add their "chuck-chuck-chuck" to the

¹In *Life Histories of Northern Animals*, Vol. I, p. 345.

spring salute. So the glad news spreads from point to point, from stone pile and log heap to brush pile and fence, summoning all the race to come forth and take part in the seasonal rejoicing.

In color, the chipmunks are brown and gray on the upper side, with a narrow black line in the middle of the back,



FIG. 47. *California ground squirrels*

Courtesy Field Museum

and on each side are two black stripes, with a light buff stripe between them. They range from northern Georgia and Alabama to Manitoba and Nova Scotia.

The West, however, is the paradise or metropolis of these rodents. Where there is only one chipmunk in the East, there are a half dozen or more in the West, some exceedingly pretty. There is the *antelope chipmunk*, the *golden chipmunk*, the *Oregon chipmunk*, the *painted chipmunk*, the *yellow-bellied*, the *large-tailed*, and the *little sagebrush chipmunks*. For the one *spermophile* or ground squirrel of the

East, the West has the *California ground squirrel*, which is spotted, the *mantled ground squirrel*, and *Kennicott's ground squirrel*, or "picket-pin." The last two are extremely abundant in Yellowstone Park, where they come almost into one's tent. In the West also are found the most beautiful of American squirrels, namely *Abert's* and the *Kaibab squirrel*. They are a beautiful blue-gray, the back rusty red, the large bushy tail gray and white. The ears are tufted with black hairs like those of the European squirrel. Besides the red squirrel, in the West they have the *pine* and *Douglas squirrel*.

FLESH-EATING MAMMALS, OR CARNIVORES

To the order of carnivores belong the following families: cats, civet cats, hyenas, dogs, bears, and martens. As their name implies, they eat flesh, which they get by killing other animals. For this mode of food getting they are well fitted by nature. They are equipped with the proper tools for



FIG. 48. *Head of cat with
open mouth*

Note the prominent canines, small incisors, and liberal supply of tactile hairs around the mouth

their bloody trade. Most important are the teeth—first the incisors, and next to them strong canines, fit for tearing up flesh. The molars are not flat-topped as in plant feeders, but have sharp edges for cutting and points for piercing. One tooth in each side, above and below, especially large and prominent, is called the carnassial tooth. The cat family has feet fitted with strong claws, to catch and hold their prey, and bodies strong and muscular, yet lithe and agile.

The carnivores form a large order, with many species and individuals. When we consider that the domestic cat and dog belong here, we must conclude that it is probably the most numerous order after the rodents.¹ Carnivores are found in all parts of the world except Australia, for the Dingo or Australian dog no doubt is descended from dogs introduced by Europeans shortly after Australia was discovered, although it is claimed by some that they were found there when Europeans first landed.

¹With the further possible exception of the hooved mammals.

CATS

The house cat. In order to understand the life history of our cats in general, and how they are adapted to their mode of living, let us watch our house cat for a day and record its behavior and actions.

Just now our house pet is sipping milk from a dish. He is fond of milk, also of fish, and now and then even nips at plants, especially the catnip. Then he lies down in a

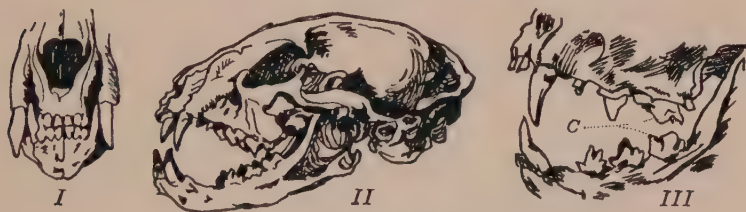


FIG. 49. *Skull of cat*
I, front view; II, side view; III, dentition. C, carnassial teeth

warm place, curled up for greater warmth, for he is fond of warmth. This would make it appear that he originally came from a warm part of the world. This is borne out by the facts; for we first learn of the cat as a domestic animal in ancient Egypt, and the wild cat which is still found in Nubia, south of Egypt, looks just like our common gray and black domestic cat.

When our cat looks up into the light we notice that the pupil of the eye is contracted into a mere slit, so that he is not blinded by the bright light or the eye irritated. So do the pupils of our eyes become smaller in bright light and larger in dim light, but they always remain round. The cat likes to rub himself against one's clothing, meanwhile purring contentedly. Then he lies down again and licks

his fur, for he is cleanly. Suddenly he raises his ears and head, looks in the direction of the pantry, and is all attention. A mouse has stirred there, and our cat heard it

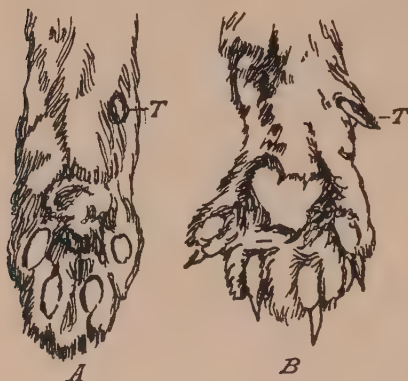


FIG. 50. *Left forefoot of house cat, lower side*

*A, claws retracted; B, claws out;
T, rudimentary thumb*

immediately, his sense of hearing being very keen. Noiselessly he moves in the direction of the sound. Suddenly he jumps and has the mouse. He gauged the distance correctly. No matter how far the cat jumps, or from what height he falls, he will always land on his feet unhurt.

How can he do all this? His eyes are so constructed that they see well in the dark. His claws can be

drawn within the toes; thus he can walk noiselessly and at the same time keep from wearing off the points of his claws, and so keep them sharp.

The cat walks on his toes, not on the whole sole of the foot, and on the underside of the toes are small rubber-like balls or pads (Fig. 50), which deaden the sound of his movements. It is from this ability to walk noiselessly that we have the saying, "As quiet as a cat."

The foreleg bones of the cat are not joined to the breast bone by a collar bone or clavicle, as our arms or the forelegs of other mammals are. Instead, they move among gristle and muscle, which form a cushion for the ends of the bones, and therefore no bone is broken when the cat jumps far, nor is the body jarred too much. When we fall on our

shoulder, our collar bone easily breaks. But this is not the case with the cat, for he has no collar bone to break.

The muscles in the legs are strong, the body rather light, so that he can jump far and sneak up near his prey. The intestines of the cat and of all other carnivores are much shorter than those of herbivores because in their food, flesh, the strength is concentrated in a small bulk—in other words, they do not need to eat so large a quantity of food as do plant eaters, so the food can

be digested in a shorter intestine than is the case with plant food. Hence the rear part of the body is thin, making the whole body light and so that it can be hurled through space more easily.

When he jumps on his prey, the claws of the cat are protruded from their sheaths and he can seize the mouse or bird securely.

Besides hearing and sight, the sense of touch in the cat is also very keen. The organs for this are the long tactile hairs around the mouth (Fig. 48, p. 66). A good cat will catch as many as twenty mice a day, if the supply is large enough. This is usually the case in barns, granaries, and the like. Therefore the cat is useful. But he needs watching. Some cats have developed a taste for birds. They will prowl about in the fields and woods, and when they find a bird they will kill it if they can. Such cats should not be allowed to roam about when the young birds are about to come out

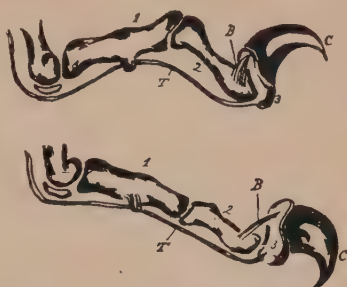


FIG. 51. Toe of cat: above, with claw retracted; below, claw put forward

C, claw; B, elastic band, which pulls claw back when pull on tendon T is relaxed; 1, 2, 3, phalanges, or finger joints

of the nest, for it is then that many of them are killed by cats. It has been figured out that the average cat is responsible for the death of about fifty birds a year. Whenever a cat is found to be an incorrigible killer of birds and young chickens, the best thing to do is to end its existence in a humane manner.

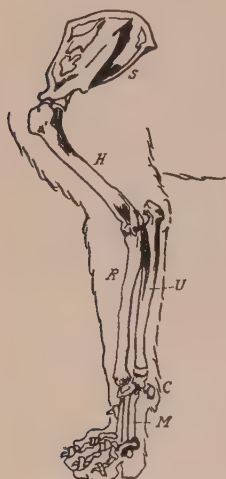


FIG. 52
Forefoot of cat

S, shoulder blade; H, humerus; R, radius; U, ulna; C, carpal bones in wrist; M, metacarpus

Twice a year the cat has a litter of from four to six young, hence the species is rather prolific. The young at first are blind, but not naked. On the tenth day the eyes open. The mother is very devoted to her kittens, and when they get older will teach them to catch mice.

Cats are not nearly so intelligent as dogs, neither are they so faithful. Indeed, they seem to have a liking only for the place where they are, and not so much for the people. Since they prowl about in all sorts of places, they may easily carry germs of disease into the home.

CATS OF AMERICA

The wild cat or catamount. Our wild cat goes under different names in the various parts of the country, such as catamount, bay lynx, and bobcat. This shows that it has a wide distribution. Among our North American cats it comes nearest the house cat in size, color, and appearance. The only differences are that it is larger, more lanky and long-legged, and that its tail is absurdly short, being only

about six inches long; hence the name "bobcat." The facial expression of the bobcat is almost exactly like that of our tabby, also the purring and the caterwauling. It is of a yellowish or reddish brown color, spotted with black and dark brown, with narrow black lines on the head and over and along the backbone. It is found in all parts of the United States and in southern Canada, notably in Nova Scotia.

The catamount lives in dense forests and on brush-covered hillsides. Here it goes noiselessly on a still hunt for bobwhites, ruffed grouse, and cottontails. Or it lies in wait on the ground or up in a tree for squirrels or birds, of which it kills many.

Bobcats hunt morning and evening. During the day they sleep in hollow trees or in cavities between rocks. Occasionally they come into villages for a chicken or a turkey, but as a rule they give men and dogs a wide berth. They never think of attacking man, but will put up a fight when cornered. The bobcat is not easily seen in the open because its colors are so inconspicuous that the animal fades into its surroundings. Like the house cat, it is fond of a little catnip now and then.

The Canada lynx. The Canada lynx is not much larger than the wild cat, and it has an even shorter tail. But it appears much larger because of its longer and shaggier hair. It has enormous paws, tufts of black hair on the tips of the ears, and a beard on the throat from ear to ear, which makes its face look large and flat. Its color is a light gray mottled with brown, a color and pattern which make it invisible at a short distance. It simply fades from view. It is found in the forests of Canada and in our northernmost states, and as far north as Alaska. It stealthily moves along by leaps and bounds, looking for hares and grouse.

In winter the lynx does not sink deeply into the soft snow because it has such large feet, which are further surrounded by hair, thus making them regular snowshoes.



Photograph by W. E. Carlin; courtesy Doubleday, Page & Co.

FIG. 53. *Canada lynx*

This lynx was caught in a trap and then turned loose with a light clog on his hind legs, the photograph being taken while the animal was brought to bay by fox terriers.

Winter is a lean season for the lynx, when it must often retire to its den hungry, having found not so much as a mouse, for in this season it must condescend even to this lowly fare. But in spite of all hardships, and perhaps

because of them, the lynx remains healthy and strong. Its home is in caves or in tangles of young growth and amid fallen trees in the heart of the forest. Here is where the litter of from two to five young is born.

The panther, or puma. The puma is the largest of our North American cats. From the number of its names, such as panther, puma, cougar, mountain lion, silver lion, and even "painter," we can guess its wide range. It was formerly rather common in eastern North America, but



After Schmeil

FIG. 54. *A lynx sneaking up to its prey*

here it has succumbed to rifle and shotgun, except perhaps in Florida and in some of the dense, swampy canebrakes of the Gulf States. In the more rugged and less thickly inhabited western part of the New World, however, it is found from Alaska in the north to Patagonia in South America.

In North America the favorite haunt of the puma now seems to be the canyons of the Sierras in California. But even here it is not often seen, because its color, a whitish yellow or yellowish brown, matches so well with the usual background among the rocks that it is well-nigh invisible. Below, it is a dirty white. Like all cats, it is nocturnal.



FIG. 55. *In the Brazilian forest*

A panther attacking a anteater, while howling monkeys and Amazon parrots are making off

The puma is a large and strong but extremely lithe and graceful animal. It is eight feet long, of which three feet are tail. The tail in this and the other large cats is moved in the same characteristic fashion as that of our house cat. The name silver or mountain *lion* is appropriate, since in color it very much resembles the king of beasts, as also in its quiet, reserved, dignified demeanor. In fact, the puma is our representative of the lion tribe.



Photograph by A. R. Dugmore; courtesy Doubleday, Page & Co.

FIG. 56. *Panther, cougar, or mountain lion*

Its prey consists of deer, mountain sheep and goats, antelopes, and jack rabbits, and also domestic sheep, calves, heifers, and foals. A ranchman's dog seems to be an especial titbit for it, hence it is very unpopular among the stockmen, who are much incensed also over its liking for colts and foals. Likewise the puma does not hesitate to kill a wolf or a coyote that comes in its way.

The question naturally arises, Is the panther dangerous to man? Many stories are told about his attacking man,

but these are in nearly all cases fabrications pure and simple. On the contrary, we have here the unique instance of a large wild animal being positively *fond* of man. There are instances on record where a mountain lion followed a man for miles, without any intention of harming him, but apparently just to see him. The most startling instance of this strange behavior is told by W. H. Hudson in his book, *The Naturalist in La Plata*. A cowboy or *gaucho* had broken his leg while far out in the pampa and night overtook him before help could reach him. Suddenly he saw a panther approach him. He grasped his dagger firmly, resolving at least to sell his life as dearly as possible. What was his surprise when he noticed that the big cat moved about him, seemingly affectionately, much as a house cat would. Later in the night a jaguar came along, which evidently desired to make a meal of the crippled man. But the panther attacked him with the greatest fury and kept him away from the man. When morning came the jaguar, badly mauled, slunk off. The same author relates instances where a panther has allowed itself to be killed rather than attack a man. However, not all panthers would be so forbearing, and when wounded, or afraid of harm coming to their young, they can put up a stiff and dangerous fight, for they weigh from one hundred and fifty to two hundred pounds, and have muscles correspondingly strong.

The two to five young are first mottled and spotted, but later change to a uniform color.

The ocelot; the eyra. In southern and western Texas and south through Mexico into South America is the pretty ocelot or *tiger cat*. This animal is rarely seen, because it lives in wild, unsettled regions and is strictly nocturnal. It is four feet long, of which fifteen inches are tail. The ground

color is a smoky yellowish brown or gray, on which are several rows of black rings and spots lengthwise on the side of the body. It lives on rabbits, prairie dogs, poultry, birds, snakes, and lizards.

In the same range and habitat lives the *yaguarundi* cat or eyra. This is smaller than the ocelot, and long and slender like an otter. It has a gray and a red color phase.

The jaguar. The jaguar is the handsomest of our large cats. Its main home is South America, but there is an overflow of it through Central America and Mexico, and occasionally one turns up in southern Texas. Its length over all is seven feet, of which two feet make up the tail. It is a strikingly handsome animal. The ground color is a rich yellowish brown or orange brown, on which are many spots and rosettes of black. Below, it is pure white, but some black rosettes are also scattered on the lower part of the body. By rosette we mean a "hollow" black spot, the center showing the ground color.

The jaguar lives in dense thickets and in the jungles along the rivers. At night it goes out for food. Its prey includes tapirs, deer, cattle, and horses. It is often a scourge to the farmer and ranchman, who call it "tiger." But the tiger is found in Asia only, just as the jaguar is found only in America. The body of the jaguar is heavier and deeper, that is, from back to belly, than that of the panther or leopard, but it is very narrow and lean, like that of the tiger, also a jungle dweller. If it were round and broad it could not so easily move through the dense growth to stalk its prey. It is very strong. Roosevelt mentions a jaguar that dragged a horse it had killed a mile. Jaguars will as a rule avoid man, but there are many cases on record of unprovoked attack.



FIG. 57. *A bit of life in the Guiana jungle*

A jaguar, having just captured a capybara, the largest rodent, sees a drove of tapirs. A toucan flies off

THE LARGE NON-AMERICAN CATS

The lion. Although the lion is not an American animal, one should know something about it because it is such a large, stately, and interesting beast. It is part of our aim in these studies to rectify mistaken notions which many people have concerning it.



Courtesy Quelle und Meyer, Leipzig

FIG. 58. *A pair of lions that has spied prey*

Note that of the two animals the female is the more aggressive

The lion is properly called the "king of beasts." He is of such a dignified presence, has such a calm, earnest look and demeanor, that he deserves that designation. He has nothing of the cringing attitude of the panther about him, nor the excessive bloodthirstiness of the tiger and leopard.

The lion is an animal of the open field, not of the forest. The plains of Africa are his principal home, and he is now



Courtesy Field Museum

FIG. 59. *The man-eaters of Tsavo*

Before being killed, these two old maneless male lions were responsible for the death of one hundred and twenty-eight Indian coolies and African natives. They measured nine feet eight inches and nine feet six inches respectively.

rarely found outside of that continent. In the plains he hides in the daytime in some thick brushy growth, or in a gully or cave. In the evening he leaves his sleeping quarters, stretches himself, and utters his thunder-like roar, which sends a chill, no doubt, through all the denizens of the plains that hear it. Then he will go stealthily to the water hole, the place where all the wild life of the neighborhood comes to drink—herds of kudu, hartebeest and other antelopes, zebra, and other animals. Here he chooses one that he likes, often a zebra. With one terrific bound he jumps on it, fastening his terrible claws in its side and at the same time biting through the vertebrae of the neck. While the king devours his meal, the hyenas form a circle around him at a respectful distance, eagerly and greedily

waiting for him to retire in order that they may finish the feast. Behind the hyenas skulk the smaller jackals, and perhaps some vultures, who finally denude the skeleton of the last scraps which may have been overlooked by the gluttonous hyenas.

The lion usually retreats before white men. He, too, seems to have learned the lesson that against a rifle the greatest heroism is unavailing. Some old lions become man-eaters because they are too old to be able to get any large wild game. They are then dangerous, especially to unarmed negroes.¹ It is a mistake for a man to run when near a lion. That more than anything else will cause him to attack. However, when wounded or excessively hungry, or afraid that the young may be harmed, a lion will not hesitate to attack a man.

The strength of the lion is truly marvelous. The great naturalist, Brehm, observed a lion which jumped over a nine-foot hedge around a *seriba* or native village, killed a two-year-old heifer, and with the prey in his great jaws, jumped over the hedge again, and dragged the heifer for a long distance to its lair in a thicket.

The full-grown lion is eight to nine feet long. The tail is a third of the length, and has a tuft of hair at the end which hides a horny, sting-like prong. The male has an enormous head, with a royal mane, which, however, is larger in captive animals in the menageries than in the wild ones. The female has no mane and looks much like our puma, except that she is heavier and has much larger paws. The color is that of the sand, rock, and dry vegetation—yellowish brown or pale reddish brown. Some lions have much black in their pelage. Because of

¹Read Patterson, *The Man-eaters of Tsavo*.



FIG. 60. *A tiger hunt in India*

the coloration, people have lived for years where they are common without having seen one.

The female gives birth to from two to six young, three being the usual number. The young are born with their eyes open and are playful from birth. Lions are easily tamed and often become affectionate toward their keepers. They also breed in captivity. Lions are found in Africa,



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FIG. 61. *A tiger in his lair*

Note how the up-and-down stripes match the up and down of the bamboo and other jungle plants. This is a fine example of a protective pattern.

where, however, they have been exterminated over large areas. In Arabia, Mesopotamia, and eastward to western India they are now seldom found.

The tiger. In the tiger exquisite beauty, ferocity, and bloodthirstiness are combined. About as large and strong as a lion, it is much more dangerous to man and beast. It sometimes seems to kill for the mere love of killing. About five thousand people are killed annually by the tiger in

India, where most tigers are found. The tiger will, more often than the lion, enter villages and kill a cow, a goat, or a man, and then leisurely make off. In some parts of India one rural mail carrier after another, at certain places along the route, has been killed and eaten by a tiger. Some roads and passes have to be abandoned because some especially ferocious tiger has his lair there and attacks the passers-by. It has happened that villages and even whole districts in India have been deserted on account of the depredations of one notoriously savage tiger.

The way the Indian princes or rajahs hunt the tiger is picturesque. Square wooden structures, like small forts, are placed on the backs of elephants and manned by hunters with powerful rifles. Beaters chase the tigers from their lairs in the jungle into the open savanna adjoining the thicket, where the elephants are posted. Now and then one or more of the beaters pays for his temerity with his life. The tigers among the high grass are either shot from the howdahs on the elephants, as those boxes are called, or, if in their rage they venture to attack an elephant, they are lifted up high into the air by the trunk and hurled to the ground to be stepped upon by the piledriver-like foot of the great animal.

The tiger is eight feet long, the rear part of the body being very thin. In color it is an orange brown, white below, with black stripes running vertically from back to belly. It has no mane, but a fringe of hair around the face.

All of Asia, but Asia only, from Siberia on the north to the islands of the Malay Archipelago on the south, furnishes the tiger's habitat, but it is most numerous in India.

The leopard. Although smaller than the lion or tiger, the leopard is, if anything, more daring, more impudent in his

attacks on man and beast, and consequently more dangerous. He has a smaller, flatter head and shorter legs than the other large cats, and is even more given to sneaking up to



After Schmeil

FIG. 62. *A leopard stalking his prey*

his prey than they are. He also excels in climbing. His body is rounder than that of the jaguar or tiger, that is, not so thin or compressed. He measures seven feet in length.

The leopard is of a rich yellow or orange ground color, white below, with numerous round black spots and rosettes, but not so many of the latter as the jaguar has. It ranges over nearly the whole of Africa and Asia, from the Malay Archipelago to the Amur River.

Closely related to the leopard are the *black leopard*, of the color implied by the name; the *white* or *snow leopard*, which is found in the mountains of Asia, and among the snow fields, and has longer hair and a warmer coat; and the *cheetah* or hunting leopard of Africa and Asia, which has longer legs and is considerably smaller than the leopard. In India this leopard has often been trained to hunt gazelles and antelopes.

CIVET CATS

Civet cats. Civet cats are long-bodied, short-legged animals, with characteristics of the cats, hyenas, and martens. The name is given them on account of the glands that excrete civet, an oil or fatty substance having a strong but pleasant odor, like musk. They are so short-legged that they can crawl over the ground like snakes.

The mongoose. The ichneumon or mongoose of Egypt and India was introduced into the islands of Jamaica and



FIG. 63. *An ichneumon, or mongoose, eating a snake*
After Schmeil

St. Lucia of the West Indies to kill off rats and poisonous snakes. This they did, but now they are killing fowl and birds of all kinds as well. In India the ichneumon is famous for its fearlessness in attacking and killing the poisonous

snakes, but is greatly disliked in modern Egypt because of its chicken-killing habits. A specimen was once captured in Kentucky, but how it got there no one knows.

It was once thought that the mongoose was immune to snake poison and could be bitten without injury. But the truth of the matter seems to be that he is quicker than the snake and avoids being bitten by dodging and grasping the snake by the back of the neck when he gets the chance. When a mongoose is bitten by a poisonous snake, he dies just as any other animal would.

HYENAS

The hyenas. The hyenas are among the least attractive of animals. To our mind they are not only ugly in outline,

color, and appearance, but are vicious in temper and disposition as well. Although they are greedy, vicious, snarling, and treacherous, they are, after all, cowardly brutes. They are the ghouls among animals.

And yet we find in this ugly brute a most beautiful correlation between its mode of living and its structure. Hyenas are made to be the scavengers of the deserts and plains. When a horse in a caravan dies, it is left on the side of the trail. Then the hyenas assemble from far and



Courtesy Field Museum

FIG. 64. *Striped hyenas*

near to hold a feast on the remains. With their forelegs braced against the carcass, they pull with their jaws and try to tear it open. Later they pull again to tear apart the bones. They therefore have very strong forelegs, jaws, teeth, and neck muscles. Thus the fore part of the body is so much larger than the rear part that the back slopes strongly downward. The teeth and jaws of the hyenas are strong enough to crush bones, and their stomachs to digest them. The esophagus is large, so that they can swallow good-sized bones.

However, they are so greedy and gluttonous that they are not satisfied with carrion. They attack and kill any



Courtesy Field Museum

FIG. 65. *Spotted hyenas endeavoring to dig out a buried corpse*

small animals that they can easily overcome and that cannot defend themselves, such as gazelles, antelopes, and the young of larger animals, such as the kudu and the gnu. They also are accused of digging out buried human remains; hence they are properly called ghouls. That is the reason why in many parts of Africa and Asia human graves are covered with large stones and thorns.

The two principal species of hyena are the striped and the spotted. The former is found in Africa and Asia, the latter in Africa only. The ground color is a dirty buff-gray with black stripes running from back to belly in the former, and black spots in the latter.

DOGS

The dog family is the fourth family of the carnivores. Dogs differ from cats in several ways. They have no retractile claws, although they also walk on the toes (digitigrade). They have a pointed head instead of a round one. The pupil of the eye is always round, not

slitted as in the cats. Dogs have a collar bone; consequently they are not so agile as cats. They do not mew or purr, but bark, whine, or howl. The young of cats are called kittens, while those of dogs are called pups. The dog runs down his prey, whereas the cat stalks it, and sneaks and crawls up to it. Both, finally, jump at it or on it. To this family belong the domestic dogs, the wolves, and the foxes.

The domestic dog. Among domesticated animals none has been so faithful and intelligent a friend and companion of man as the dog. A cat is not so much attached to a person as



FIG. 66. *Skull of dog*
C, carnassials

to a place. A cat rarely accompanies its master or mistress for miles over the road, as a dog will, much less will a cat grieve itself to death on the grave of its master, as dogs are known to have done. A dog is always on the lookout to do something for his master, something to please him and be of service to him, while the cat is more self-centered.

No other domestic animal has been separated into so many varieties by environment, food, treatment, and crossing as has the dog. Note the extreme slenderness and speed of the greyhound and then the thick, heavy-set body of the bulldog or the Pomeranian. In color, build, and size there is every possible gradation. A huge St. Bernard weighs as much as two hundred and fifty pounds, while a tiny Yorkshire terrier may weigh as little as ten ounces. Compare the long, shaggy coat of the Eskimo dog, poodle, or collie with the sleek coat of the pointer, bloodhound, beagle, great Dane, or even the Mexican hairless.

Think of the multitude of services to man to which the dog has been trained! In Belgium, large dogs draw milk wagons; in Newfoundland, carts of wood. The collie and shepherd dog do yeoman service in driving and rounding up the flock at the mere word of the master. The fine,



FIG. 67. Left
forefoot of dog
T, rudimentary
thumb

large, faithful St. Bernards were formerly sent out to bring food and succor to travelers who had been overwhelmed by the snow or cold on the lofty Alpine pass. Others protect the property, house, and children of the owner. The bloodhound, with his marvelously developed sense of smell, is used to track criminals. The German police dogs worked heroically during the Great War to locate wounded soldiers. Especially as a companion or helper to man on the hunt has the dog proved his sterling worth. He will indefatigably trail and chase the game animal and drive it toward his master. The water spaniel will leap into the

water and bring to shore the ducks shot by the hunter in the blind. The retriever will get dead quail and rabbits. The Newfoundland dog has saved many people, mainly children, from drowning. The odd, long-bodied, and crooked-legged dachshund goes into the burrows of badgers (German, *Dachs*) and foxes to chase them out for the hunter, as the beagles go under brush piles and culverts to scare out the elusive cottontail, while the pointer and setter will point out to the hunter where the game birds are under cover, so he can be prepared to shoot when they fly. The Eskimos could hardly live where they do, away up in the frozen north, if it were not for the dogs that draw their sledges.

If we watch dogs, especially hounds, as they move about sniffing and smelling at everything, we can easily guess that smell must be their keenest sense, after which come hearing and sight. Their large, always moist nostrils indicate this keenness of smell.

In spite of all this one must come to the conclusion that dogs do not fit into the homes of man in our present-day overcrowded cities. Where the farmhouse stands in the midst of wide fields and wood lots is where dogs are, and ought to be, the friends and companions of man. In our cities the dogs sniff into and investigate unclean nooks and corners and thus get into and on themselves filth and germs of disease. They harbor a tapeworm whose eggs may be on their mouth and thus be transferred to children. One should never allow a dog to lick the hands or face of children. Then there is the danger of hydrophobia, which probably attacks more of the neglected and ownerless dogs in cities than in the country. Cats and dogs in the homes of man are a relic of a former civilization, when there were fewer people and these lived farther apart. These animals do not properly fit into our city dwellings.

When America was discovered the Indians had dogs, but that race seems to have disappeared.

The gray or timber wolf. When the first colonists settled our Atlantic seaboard they found the wolf everywhere. Not that they saw much of him, but they could hear his dismal howling around their cabins nightly and could see traces of his depredations in the form of torn and partly eaten sheep, calves, and deer. The wolves were soon driven out of the settled regions or exterminated, but wherever pioneers made their settlements they had the same experience with wolves—in Ohio, Indiana, Iowa, and westward.

In most places the rifle, the trap, and, lately, poison have proved too much for them. They have disappeared everywhere except from the extensive forests of our northernmost states and from the sparsely settled western mountain regions. Neither could they be driven from the great swamps of Florida and the Gulf States.

In the West is where the wolves now do most harm by killing sheep and other range animals. One old wolf in



FIG. 68. *Skull of wolf*
C, carnassials

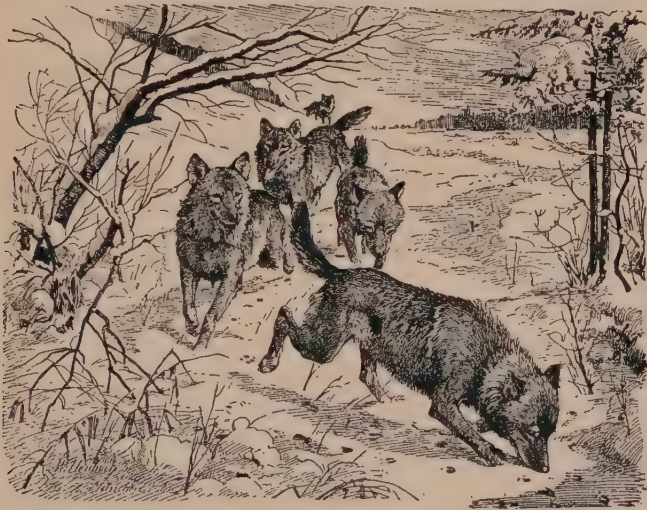
Colorado had killed about three thousand dollars' worth of live stock before he was killed. Some of these western stock-killing wolves have become famous, or rather notorious, for their prowess and for the uncanny slyness with which they baffled all pursuit. Such

a one was "Big Lefty" in Colorado and the "Custer Wolf" of South Dakota. It is estimated that the latter killed twenty-five thousand dollars' worth of stock before he was finally brought to bay.

In addition to ranch and farm animals, the chief prey of the wolf are deer, young elk and moose, jack rabbits, and, if hard pressed by hunger, even the lowly mouse. I know of a wolf on the ice of Lake Doré, near Pembroke, Ontario, that was killed by eating a dead mouse into which a bit of strychnine had been carefully inserted. Wolves do not hesitate to kill even their cousin, the red fox, when they meet with him. No sentiment about the wolf!

The present-day wolves have so thoroughly learned the lesson of man's rifle, traps, and poison that it is extremely difficult to get any of them by these means. Furthermore,

the fear of man is bred into the present generation of wolves. Even the faintest trace of the odor of man is an abomination to them, and they despise man's most skillfully concealed traps and most carefully prepared poison bait. By their extraordinarily keen scent and their hardly less keen hearing and sight, they are enabled to detect and escape man's



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FIG. 69. *A pack of wolves following the tracks of deer*

devices and tricks. Thus they are able to levy heavy toll on the animals of the ranges of our West. In fact, they are slowly regaining parts of their former range, and are occasionally found even in Illinois, Indiana, and Kentucky.

How can they catch the swift-footed deer? While very swift on foot themselves, they are no match in speed for the deer. Therefore the wolves hunt in packs and relays, and thus are able to run down the deer. Even then they could not do it if the deer did not run in a circle—a large

circle of twenty or thirty miles, but still a circle. An old veteran of the pack will begin the chase, the rest of the pack following. Then another relieves the one that trails closest to the deer. At the same time they cut across the circle wherever they can, and finally the deer is tired out. The wolf which is nearest gives tongue, announcing the fact, and the pack hears and closes in for the killing. They jump at the throat of the deer, and his life is soon snuffed out. As a rule they eat only a part of their kill. For the next meal they kill a fresh animal, and thus are very destructive to deer.

Wolves live in natural caves or make a large burrow for themselves in a hillside in some wild spot. They are prolific, having from eight to twelve young in a litter. The parents are very devoted to their young, the mother staying with them, and the father bringing in food as plentifully as he can and then taking up his station a little distance away to stand guard over his family.

The color of wolves varies from whitish or yellowish brown or gray, with many black hairs between, to entirely black, as in the Florida wolf and the Russian wolf. The "Custer Wolf" was almost white from age. All wolves have a heavy, bushy tail.

The stories in newspapers about wolves attacking man and chasing him up a tree are, in ninety-nine cases out of a hundred, falsehoods. They happened only in the fertile brain of the reporter, for only in very exceptional cases will our wolf attack man. The Russian wolf, on the other hand, will do so much more frequently.

The "Custer Wolf," when finally killed, measured six feet from tip of snout to tip of tail, which was fourteen inches long, but this was a rather undersized wolf.



FIG. 70. *A coyote, or prairie wolf, caught in a trap*

Other wolves. In the arctic regions is found the *arctic wolf*, which is very large, has heavy and long fur, and is white the year around. In South America is found the *red wolf*, which, though more aggressive toward man, often interbreeds with the domestic dogs of the ranchers.

The coyote, or prairie wolf. The coyote is a small edition of the gray wolf. It has the same color, appearance, and bushy tail as the wolf, but it is smaller, weaker, and less courageous. It has some of the slinking behavior of the hyena, but is even less aggressive. It is a true plains, steppe, or desert animal, and therefore is found principally in the western part of our country. Its range extends from Minnesota to Texas, California, and British Columbia. Some have lately been shot in Wisconsin and Michigan.

The coyote, like the wolf, is nocturnal and also hunts in packs. It digs a burrow for its home, where the young, sometimes as many as fourteen, are born. It always looks

ill at ease and miserable. Its food consists of jack rabbits, sage grouse, prairie dogs, gophers, and carrion. It also makes itself obnoxious to farmers and ranchers by killing sheep, calves, and poultry. Like the wolf, it is difficult to trap or catch. Observe that the name "coyote" is a Spanish word and that the final *e* must be sounded, although it is most often wrongly pronounced *kī'ōt*.

The red fox. From the time of the ancient Greeks until the present no animal is mentioned so often in the literature of the nations as is Renard the Fox. This is because of his cunning, wherewith he foils so many carefully laid plans to capture him, his alertness to act in the presence of danger, and his apparent sense of humor, by which he turns the table on his pursuers. Thus he has made himself the most popular and amusing figure among animals. What he does



not know in the way of tricks to elude and delude his pursuers is not worth knowing. He will double on his tracks, run on top of a rail fence or in the shallow water or on the stones of a brook; he will even run up a tree for a distance, run out on thin ice so that the pursuing hounds break through, or concoct similar schemes on the spur of the moment.



The first settlers did not find it so difficult to trap or shoot him, but since then he has learned quickly and well, like the wolf. He still thrives in long-settled regions, as in the New England States, because his cunning is such that he is safe wherever he chooses to stay.



FIG. 71
*Trail of a
stalking fox*

His alertness and sagacity are due to his extremely keen senses of hearing, sight, and scent. He also is nocturnal. His sparkling eyes

betray his lively wit, and his large ears, always turning in different directions, show his alertness. His body is extremely lithe and agile, made for sneaking up to his prey or for getting through and out of tight places. He is very swift on foot, but usually travels at an easy pace, placing one foot before the other, thus making a track like



FIG. 72. *A red fox and her young*

that of a cat or of a biped (Fig. 71). He can also swim and even climb.

The food of the fox consists of anything he can get—cottontails, bobwhites, ruffed grouse, squirrels, woodchucks, rats, mice, and also chickens and ducks from the barnyard as well as the eggs and young of birds. This is why there is enmity between the farmer and Renard, but the latter disdains the farmer's anger and his traps and guns. Furthermore, it is doubtful whether the fox may not be doing more good than harm, since he kills many noxious rodents.

For a home, he digs a spacious burrow under a big old tree on a river bank or in the middle of a forest. The

burrow always has at least two entrances. The fox is forty inches long, of which fifteen inches make up the heavy and bushy tail.

The red fox ranges from Georgia to Nova Scotia and Alaska, but is not found in the desert regions of the West. His color is bright yellowish or rusty red, grayish on the rump and flanks. The ears, the front of the legs, and the tips of hair on the tail are black, while the throat and the tip of the tail are white. The *cross-fox*, *black fox*, and



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FIG. 73. A fox stalking a pheasant

silver fox are nothing but color phases of the red fox. That means that a pair of red foxes may at any time have among their young a black or silver fox. The silver fox is the same as the black, except that the tips of his hairs are white. Then too a pair of black foxes may have one or several red ones among their young, which number from five to eight.

Other foxes. Occupying about the same territory as the red fox—without, however, going so far north but extending farther south into Mexico—is the *gray fox*. It is about the same size as the red fox, but gray instead of red. It has more black hairs in its pelage, and no white

tip to the tail. It is not quite so cunning as the red fox, nor does it always make a burrow for itself.

Out West are the small *desert* and *kit foxes*, about twenty-five inches long, but swift of foot and rarely seen. In the far north, from Hudson Bay to the Arctic Ocean, lives the *arctic*, *blue*, or *white fox*. He is white all the year round, but in summer the fur is shorter and less thick, so that the blue color of the under fur can be seen, hence the name, blue fox. This white fox follows the lemming migrations in the fall and kills many of these animals, which it hides under the thick moss as food for winter—an instance of cold storage in the animal world!

BEARS

Bears are large, burly brutes, with long shaggy hair, small ears, and a short tail. Though clumsy in appearance they are surprisingly nimble and agile, easily outrunning a man. They walk on the sole of the foot like man (plantigrade), not on the toes as do the cats and dogs. They can walk upright as well as on all fours, and they attack in the upright position by hugging their antagonist and crushing him, at the same time mauling him with teeth and claws. Most of them hibernate. The story that when hibernating they suck on their paws in order to endure the long fast is not true. Although they are carnivores, all bears have a sweet tooth, being fond of honey, sugar, berries, or anything that is sweet. The young are called cubs.

The black bear. The black bear, of which the cinnamon bear is but a color phase, is not at all the dangerous beast that people take him to be. On the contrary, he is rather good natured, playful, and occasionally even fond of men. Many a berry picker in the woods has, unknown to himself,

been watched at his work by a black bear, much as the fox sometimes watches people at a safe distance at their work or play. This is easily explained. Although a flesh eater, the bear is not quite swift enough to catch some of the animals which the more stealthy cat or the swifter wolf can get. So he has to rely on other fare besides flesh, such as plant foods. He is omnivorous. And omniv-



Photograph by A. R. Dugmore; courtesy Doubleday, Page & Co.

FIG. 74. *A Florida black bear*

orous animals are not so fierce as the flesh eaters. The bear not only kills pigs, of which he is very fond, and calves and such large quarry, but stoops to such humble fare as large black ants in rotten logs, frogs, snails, and grubs, and he is especially fond of sweet things, such as berries, fruit, and honey. When he has discovered a bee tree he proceeds to scoop out the honey, and does not in the least mind the stings of the angry bees.

One day, while taking a walk over a silent woodland path in the Canadian woods, I suddenly noticed a mother bear

with two large cubs coming in my direction on the same path. Determined to see what she would do, I stood by the side of the path. When the bear noticed me she reared up, the better to look ahead. When she finally made me out, she dropped down and speedily made off into the dense growth on the side of the path. Unfortunately, all three were killed during the next few days by men who were evidently more bloodthirsty than the bears. The bear will not attack man unless provoked by a wound or by the fear that the person has intentions against its young.

As winter approaches, the bear looks up a large hollow tree or a cavern of some kind in which to hibernate. The hibernation period in the South lasts only a few weeks, but in the North continues from two to four months. How it is possible for such large animals as bears to abstain from food for so long a time, and live, is hard to understand. Some people even claim that when the bear comes out from his long sleep he is just as fat as when he went in. However, when he finally emerges from his voluntary prison he is in very bad

humor, for the skin cracks from the soles of his feet, there is little vegetation out, and little food to be found. We can understand that his temper is not of the best, and that at this season it is safest to stay out of his way. It is then that he tears open rotting logs to get insects hibernating



FIG. 75. Tracks
of a bear

there, nor will he then despise a frozen snake or frog—in fact, anything will do. Later on he can get succulent water plants, then sweet berries, acorns, and mushrooms. If luck favors him, he gets a fat woodchuck, a pig, or a

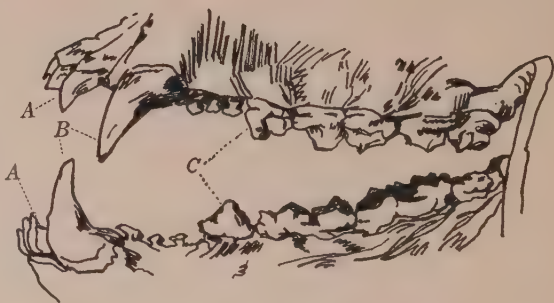


FIG. 76. *Skull of a bear*

A, incisors; B, canines; C, carnassial teeth, the largest of the molars

FIG. 77. *Dentition of a bear*

A, incisors; B, canines; C, carnassial teeth, the largest of the molars



calf. Bears are also fishermen of no mean ability. With all this high living in summer they become fat and happy.

The black bear averages five feet in length. In color he is entirely black, with a brownish face. Some are chestnut brown or light brown—the so-called cinnamon bear—which is simply a brown black bear.

The forest regions of North America, from Alaska to Florida and from Labrador to Mexico, afford a home for the black bear.



Courtesy Field Museum

FIG. 78. *Sonoran grizzly in Arizona*

Even this large carnivore looks for such lowly fare as insects and grubs

The grizzly bear. The grizzly is a much less good-natured fellow than the black bear. He is a big, rough brute and the fiercest of all bears in the world. When our West was first settled, and for some time afterwards, the grizzly often attacked stockmen or prospectors unprovoked, but now he has learned the power of the rifle and gives man a wide berth. He can kill anything he finds on his range—black bears, deer, horses, cows, down to sheep and dogs.

The grizzly chooses for himself a range which he seems to mark off by putting his mark on trees. He stands up as high as he can against a tree and tears off bark as high as he can reach. Most animals, including the black bear, make off when they see this trade-mark and usually leave the neighborhood. The black bear can escape from the

grizzly by climbing a tree, which the grizzly either cannot do at all or not nearly so well as his cousin.

By killing foals, cattle, sheep, and other range animals the grizzlies make themselves extremely unpopular among the western ranchmen and farmers, who make war on them and often offer large bounties for the scalps of these killers of stock.

Grizzlies are from six to seven feet in length. They range in color from reddish brown and brownish yellow to gray and black on the back and legs. Having longer hair than the black bear, they are shaggier in appearance.

From Hudson Bay northwestward to Alaska, and from there southward to Utah and California, the grizzly bear is found. There are several varieties in the various parts of the range.

The polar bear. The polar bear is an animal of the far north, the land of the midnight sun. As befits animals that live where there is snow the year around, its color is white throughout the year. The polar bear is found not far from the ocean or one of the inlets. He is a beach ranger, patrolling the coast looking for dead fish thrown up by the waves, or dead whales and walruses killed by whalers and left behind. But he is also a good hunter of live game. He will swim out to a seal on the edge of a cake of ice, approach from the opposite side, then dive under the ice and come up where the seal lies at the edge of it, thus cutting off its escape. Or he will lie in wait on the ice at the breathing hole of a seal, and will quickly seize the seal when it comes up, draw it out of the water, and devour it. For a change in his bill of fare, he also catches fish. In summer there is a profusion of berries on the small shrubbery of the tundra, which furnishes a feast for our bear.

The polar bear has not only a dense covering of fur to keep him warm, but under the skin is a layer of fat. This helps to tide him over the long cold winter, both because it keeps him warm and it gives off sustenance when the bear eats no food. For during the long northern winter the polar bear hibernates. He lies under a ledge of rock and allows himself to be snowed under. His warm breath makes a chimney-like opening for air to get down to him. Here also the one or two cubs are born and nursed by the mother in these close quarters, although she gets no nourishment for months at a time. When spring finally comes, the bears



Courtesy Field Museum

FIG. 79. Polar bears. One of the parents is giving a seal to the cub

break out, the mother lean and gaunt and ravenously hungry, the cubs jolly as cubs can be.

The polar bear is seven feet long, its fur white, tinged with yellow, while its nose and lips are black. Northern circumpolar regions, south to Labrador, afford a home for the polar bear. There are no bears around the south pole.



Photograph by A. R. Dugmore; courtesy Doubleday, Page & Co.

FIG. 80. *Kadiak bear*

The largest species of bear known, sometimes growing as large as an ox

Other bears. In Alaska and the adjoining islands, in addition to the grizzly and black bears, dwells the immense *Alaska brown bear*, and on Kadiak Island the even larger *Kadiak bear*. The skin of the latter measures up to ten feet from tip of snout to tip of tail. This is the largest of all carnivores, attaining a weight of fifteen hundred pounds. Near by, in the Mount Saint Elias Alps, is the habitat of the smallest of our North American bears, the *glacier bear*, which is only about four feet long. Its color varies from gray to bluish gray. Little is known of its life history.

The raccoon. The raccoon fills a rather important place in the lives of our country boys. When Indian summer comes along, with its warm, hazy days and cool, crisp nights, what country lad does not feel the urge to go out in the evening after the "coon," as he is usually called? The hunter plods on after the coon dog, who betrays the raccoon's whereabouts by an occasional yelp or bark, until suddenly there is heard a loud, deep-toned baying, which means a "coon" treed. When the hunters come to the tree they light torches and soon make out the eyes of the raccoon, shining like fiery coals up in a crotch of the limbs. A shot sends him tumbling down, and if he then makes any attempt to get away the dogs quickly dispatch him.

We must admire the raccoon for his craftiness and resourcefulness, which enable him to maintain a hold on existence in settled regions where other wild animals have long since been driven out. In the vicinity of Boston raccoons are even said to be on the increase, and they hold their own right up to the city limits of Chicago.

What enables the raccoon to cling to existence in the face of much persecution and many handicaps? For one thing, he is nocturnal, going out on his food expeditions mainly at night. And then he is omnivorous and can get along on almost any kind of food. He eats birds and their eggs, squirrels, and chickens. He can open mussels, clams, and oysters, is fond of frogs, also likes acorns, nuts, fruits, and vegetables, and if he can get corn when it is in the milky stage, he is happy. He has the habit of dipping his food into the water of the creek or brook or pond near which he lives, hence his German name of *Waschbär*. For this reason, also, he inhabits woods in river and creek bottoms. He makes his home in a hole high up in a tree, where he



Photograph by W. E. Carlin; courtesy Doubleday, Page & Co.
FIG. 81. *Raccoon*

sometimes uses an old hawk's nest to hold his siesta in, or it may be in a large cavity nearer to the ground, or even in a hole between rocks, or in a burrow. Here, in April or May, the four to six young are born, and remain in their home for a long time. They are blind, naked, and helpless when born, and therefore need the care of the parents longer than the young of many other animals.

Thirty-two inches in length, the raccoon is gray in color, the hair somewhat yellowish at the base, dusky or black on the tips; dark on the back, face whitish, with a black band running back from the nose through the eyes; feet black; tail bushy, club shaped, whitish gray, with black rings.

The raccoon is found throughout eastern United States, from Florida to Quebec, and westward to the Rockies, with several geographic races in the several regions.

Texas bassaris, or ring-tailed cat. The Texas bassaris, also called *cacomixle*, is a pretty catlike creature found from Texas westward and northward to Oregon. Its body is more slender than that of the raccoon, and its tail is longer and bushier, ringed with black and white. It is a great destroyer of rats and mice, and can easily be made a pet.

MARTENS

The martens form the last, and in some respects the most interesting, family of the carnivores. They are the smallest of them, but what they lack in size they make up in stealth and fierceness. If the large carnivores were as bloodthirsty as these little ones, they would be about a hundred times more dangerous to man than they are now. Some of the animals of this family seem to kill merely for the love of killing, since they cannot make use of all they kill. They are really bloodthirsty, since in many cases they

do not eat the flesh of their victims, but only suck the blood. As they sneak up to their prey their bodies are much elongated and their legs very short, making some of their movements snakelike. Some of the most valuable fur bearers are in this family.



After Schmeil

FIG. 82. *Foot of
otter, from under
side*

The otter. When our country was first settled the otter was commonly seen on the banks of most rivers and lakes. But as it is a somewhat large animal, four feet long, every inch of it covered with fine silky, glossy dark brown fur, it was so relentlessly hunted and trapped that many rivers and lakes soon knew it no more. However, since it is thoroughly aquatic and a great traveler, it is apt to reappear suddenly in parts of its former range where

for years it has been absent. Thus it was found again in the Potomac River, near Washington.

Its main food is fish, which it must catch. Therefore, by its bodily structure it is admirably fitted for such a life, with its body spindle-shaped, like that of all water mammals and fishes. The head is small, the neck as thick as the head, the body not much thicker than either, the tail broad at the base, but tapering to a point. Thus there are no sinuses or hollows where the water might hold back the body. The legs are short and strong. The toes on the hind feet are webbed. This structure enables the otter to swim as fast as a fish, which it can catch with ease. As a rule it fishes out the best fish only, such as trout, bass, and salmon, and eats only the best parts of each. This diet the otter sometimes varies with muskrat or duck, or he hunts on land and captures a grouse or a squirrel.

The otter is very playful. In the quiet woodland lakes in Canada one may sometimes see a family of old and young ones at play. They evidently enjoy their games immensely, for they go at them with great zest. However,



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FIG. 83. *Otter having just caught a fish*

it is a rare privilege to see them thus, because they are extremely wary. Their scent and hearing are of the keenest, and they easily make themselves invisible. This, together with the fact that they are aquatic, makes it still possible for them to stay near the haunts of man, although their numbers have been sadly decimated, and over parts of their former range they have disappeared.

Besides playing hide and seek in the water amongst themselves, they make slides down the banks of a river or lake. In summer they moisten the clay to make it slippery, and in winter they ice it. They are easily tamed and make amusing, though somewhat mischievous, pets.

Otters are found in all parts of North America, and also in the Old World. Along our western coast is, or was formerly, found the *sea otter*, slightly larger than the otter. Owing to its valuable fur, it has been nearly exterminated, though a few are still found along little-visited parts of the

coast of Alaska. Otters live in burrows, one entrance being below water and one above.

The mink. Not long ago I was staying with friends on one of the fine Indiana farms near the classical place called Bingen. One morning the mother of the house came in from feeding the chickens with a troubled look on her face. She said that thirty of her finest chickens were lying dead in the coop. Hurrying out, we found it so but found no trace of the culprit. All the little holes in the chicken coop were closed up except one. Around this were placed several traps in such a manner that an animal trying to get in could hardly avoid stepping on at least one. The next night the animal got in again without getting caught, and killed thirty more chickens. For the following night the traps were even more carefully placed and baited, but the animal got in a third time and killed forty chickens. Then that one hole also was securely closed, and no more chickens were killed. However, the next morning a neighbor sent word that about thirty of his chickens had been killed in his coop, and the same thing happened again the following night. Then the irate owner stood guard over the chickens with his gun, and, sure enough, the miscreant came again and was promptly killed. It proved to be a mink, as we had surmised.

This is typical of the work of the mink. It kills many victims when it has a chance, and merely sucks the blood, or a little blood of each, then leaves the scene of its murder.

Nor does it require a large hole to admit a mink. It may enter by a hole so small as to be easily overlooked. The mink is twenty to twenty-two inches long, of which four inches are tail. The body is of small diameter and the legs are short, so that it can stretch itself and sneak along like a snake.

The mink is equally at home on land and in the water, in the tree top and underground. In the water it catches fish with almost the ease of an otter, and will soon clean out a fish pond. It will also draw under water the young ducks swimming on the pond. In the trees it robs nests of their eggs, or devours the young and old birds. To offset this damage it also does some good by killing many rats and mice.

The color of the mink is brown, in some cases almost black, the under parts and chin, white. It fairly fades from view at only a short distance, especially in the autumnal woods and fields. As a rule it moves along with arched back, and by short, successive leaps. It is active by day and by night, although it prefers darkness. In its den or burrow, which is in a bank or under a stump or between the roots of a tree, the litter of from four to twelve young is born in April or May.

The mink is eagerly sought for, not only because of its depredations but because its fur is so valuable. But in spite of the hunter and trapper, it persists in thickly settled regions, even in villages and towns. Mink are found from the Gulf to Alaska.

The weasel. The weasel is a counterpart of the mink, only smaller and more snakelike, and perhaps even more bloodthirsty. The male is sixteen inches long, the female thirteen, of which five inches make up the tail. The black beady little eyes of the weasels seem to gleam with a cold-blooded, cruel ferocity. If interfered with, they will not hesitate to jump at a man. The weasel hunts on and below ground, but sometimes chases a squirrel, or follows it by scent, into a tree. It is not so much at home in water as the mink. Its home is made in an intricate system of runways



FIG. 84. *A weasel in winter*

under a stone pile or under the roots of a tree, with several exits, so it is very difficult to dig out the weasel. Here the five or six young are born. They have few enemies, for, besides being small and vicious, they have a strong and disagreeable odor, which is also true of the mink, the fox, and many other wild animals.

The weasel attacks animals several times its size, such as cottontails and large chickens. It will jump on the back of a rabbit and fasten its teeth in the neck. The frightened cottontail darts off, but cannot shake off its wicked rider, who in the meantime proceeds to suck out its lifeblood, until the poor rabbit falls down exhausted and bloodless. If a weasel gets into a chicken coop it also kills from twenty to thirty chickens at one time, sucking a little blood only from each one. But it also kills innumerable mice and rats, and in this way it is of much benefit in barns and granaries.

The weasel in summer is brown with white or yellowish white below; in winter it changes to all white, except the tip of the tail, which is black both in summer and winter.

In the South, however, where there is little or no snow in winter, weasels do not change their brown summer dress.

The *least weasel* is only six inches long and without the black tip of tail. The largest weasel is found in Alaska, where it is also called *stoat*, from its resemblance to the European animal of that name.

The marten. In the northern forests is found the marten, or pine marten, from which the whole marten family gets its name. Its body is not so elongated as that of the weasel, and it has also a bushier tail, thus somewhat resembling a large squirrel. Its color is brown. It is more arboreal than any other member of this family, being able to race through the tree tops as fast as a squirrel, and in this way catches much of its prey. It kills woodchucks, hares, birds, and sometimes its own young. For dessert it now and then takes beechnuts or a little catnip. The fur is valuable.

Farther to the north, in the dark evergreen forests, lives a still larger and more relentless hunter of the marten family, the *fisher* or *pekan*. It is three feet long and has the same lithe body and bushy tail as the marten. When hungry, it does not hesitate to kill its own cousin, the marten. But it has a deep dislike for and distrust of man. Where he appears, the fisher retires still farther into the wilderness, although, owing to its slyness and wariness, it could perhaps maintain a hold on existence near and among men. The fur is very valuable.

The skunk. One day while walking along a little-used country lane with an old-fashioned "snake fence" on either side, I noticed a pretty black and white animal with a bushy tail leisurely walking ahead of me between the road and the fence. It was accompanied by four little ones, which looked very cute. When I hurried my steps to get nearer,

the old one threateningly raised her tail, and I fell back. Then she ambled along, not even deigning to crawl through the fence. Only when the fence came to an end did she turn to go into the woods. It was a skunk.

How is it that this member of the marten family, most members of which are more than ordinarily nimble, quick, and wary, can afford to be so slow in its movements? At the same time it holds its own, and has not been exterminated in any large part of its former range. There must be some compensation for this lack of agility in getting away from enemies. And so there is. The porcupine has its spines, but the skunk has something even worse—a horrible odor. This stench is produced by an oil secreted in two sacs or glands beneath the tail, and it can be ejected in fine streams through small openings by pressure from within the body. It is not true that it uses its tail to hurl the evil-smelling liquid. It can throw this fluid from six to ten feet, rarely fifteen, but one can smell it a mile. The stench is sickening to man and beast. That is why the skunk usually is let alone except by the trappers who are after its valuable fur. That is why its body is not built upon such lines of nimbleness as that of the mink or marten, but on the contrary is rather heavy set. It can afford to take its time.

The skunk's color is a glossy black over most of the body. A white line begins at the nose, runs over the head, and branches into two broad white lines, one on each side of the body. There is also some white in the tail. As the fur is thick and long, it is valuable, and the less white there is in the pelage, the more valuable it is. There are now even skunk farms, where the animals are raised for their fur. Not only has the skunk not been exterminated, but it

shows a decided preference for the vicinity of man, although man has never encouraged it. It often makes its home or burrow right under farmhouses, barns, or granaries. It forces its attention and its friendship on man. And if let alone it will play no evil-smelling tricks on him, either, but rather help him along by killing rats and mice.



Photograph by A. G. Eldredge

FIG. 85. *A group of skunks*

Skunks eat many grasshoppers and May beetles and their larvae, the injurious white grubs. They must be able to smell this garden pest, because they dig the grubs out of the ground. If you find little holes in the ground, as though scraped out with small hands, these are probably the work of a skunk. These animals are nocturnal, and in their nightly prowlings they also kill a good many bobwhites on their nests, or suck out the eggs. They also kill chickens whenever they can get into the chicken coop. But when the coop is made skunkproof, the chances are that the skunk does much more good than harm on the farm.

When the skunk's home is not below the barn, it may be beneath a pile of wood, or in an old stump, or in a hole of some kind. Here from four to ten young are born. In winter the skunks stow themselves away, sometimes several families in one hole, and sleep and dream away part of the time, without strictly hibernating.

In its several geographical varieties the skunk ranges from the Atlantic to the Pacific and from Great Slave Lake to Guatemala, and in the mountains up to an elevation of thirteen thousand feet.

In the West and Southwest there is a smaller, daintier species of skunk — erroneously called "civet cat" — the real name of which is the *little striped skunk*. It has several crescent-shaped white lines over the body, but not such broad markings as the larger one. When a person follows it closely, it rears up the body, walking on the forelegs, thus to get the spray of odoriferous liquid nearer to the nose of its pursuer. When it does this, the person is sure to turn back. The little striped skunk is about the size of a fox squirrel.

In the Southwest and in Mexico is found the nearly white *hog-nosed skunk*, or *hydrophobia skunk*. It sometimes sneaks into houses at night and bites sleeping people, who later develop hydrophobia.

The badger. The badger seems to be an animal "with a grouch." It is not a bit playful like the otter, but always for itself, and always ill-humored, except perhaps for a short time at mating. Even then it does not seem to enjoy the company of its mate or young. It is an animal of the open plain or prairie. Here it makes its home in a burrow and feeds on prairie dogs, ground squirrels, and other rodents. Therefore it is very useful. But its burrows are



FIG. 86. *A badger*
Note the flat shape of the body

not liked by the farmer and stockman, as they are dangerous to cattle and horses.

When a badger is overtaken too far away from its hole to reach it, its mode of defense is to flatten itself out on the ground, so that its outline disappears. In fact, its whole body is low and flat, while the legs are short, but strong, so that they can dig well.

The color of the badger is gray, with much white on the head, and a white line runs down the back. Badgers are found from Michigan northwestward to the Peace River in Canada, and from there south to Pueblo, Mexico. Now and then one is seen in Illinois. They are from twenty-seven to thirty inches long.

The wolverine. The wolverine is the largest and strongest of the martens. It is so big and strong that it need have no fear of natural enemies, and thus it need not be slender or built for speed. It is a heavy-set animal, and



FIG. 87. *A wolverine*

looks more like a young bear than a marten. It is black on the face and feet and a blackish brown elsewhere.

Although it looks dull and drowsy, the wolverine is one of the most difficult animals to trap. Trappers dislike it exceedingly, because it is keen enough to spring a trap without being itself caught, and to take out the bait or the caught animal and devour it, thus cheating the trapper out of the reward of his labor. It also finds the "caches" of food that trappers or explorers hide away for their return trip.

The fox is cunning, the wolf more so, but the wolverine seems to be the most cunning of all, although this is denied by some trappers, who say that it is no more difficult to catch than a mink or an otter. They probably differ in the various parts of their range. The wolverine lives in the far north, up to and beyond the tree limit, where there are not many people. It is about three feet long.

FIN-FOOTED MAMMALS, OR PINNIPEDS

To the order of pinnipeds belong the seals and walruses. When one looks at the skull of these animals he must come to the conclusion that they belong to the carnivores, because they have the same kinds and arrangement of teeth—incisors, canines, and carnassials—and the skull is shaped like that of the flesh eaters (Fig. 88). But if one looks at the feet, he must come to the conclusion that they ought to be in an order by themselves, as their limbs are so differ-

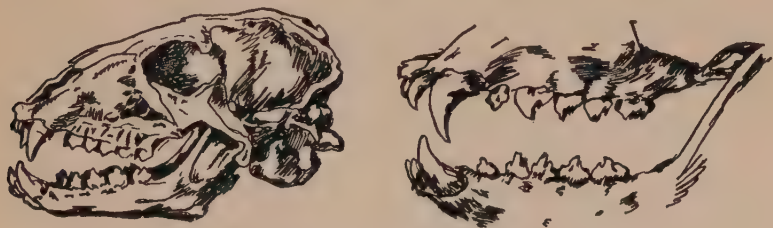


FIG. 88. *Skull and teeth of seal*

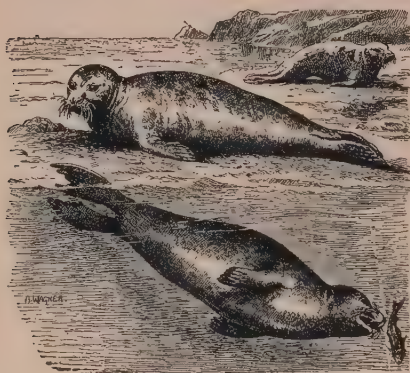
ent from those of the carnivores that it seems somewhat unnatural to lump them in one order. Their feet are really nothing but finlike flippers to enable them to swim well.

These animals are made for a life in the water only, their body, which is like that of the otter, dolphin, or manatee, being cigar-shaped to make rapid progress under water possible. For the same reason the outward ears are nearly or quite absent and the hind feet are placed as nearly as possible at the end of the body to make them all the more efficacious as propellers. As a consequence, the animals are nearly helpless on land.

Their food consists of fish and mollusks, such as cuttlefish, small squids, and octopuses. They come on shore,

usually along rocky shores, to bask in the sun and to have their young. At all other times they are in their favorite element, the water. There are three families of pinnipeds — the eared seals, the walruses, and the earless seals.

The fur seal. Among the eared seals, the fur seal or *sea bear* is easily the most interesting and the most important species. Its summer or breeding home is the islands of



After Schmeil

FIG. 89. *Seals*

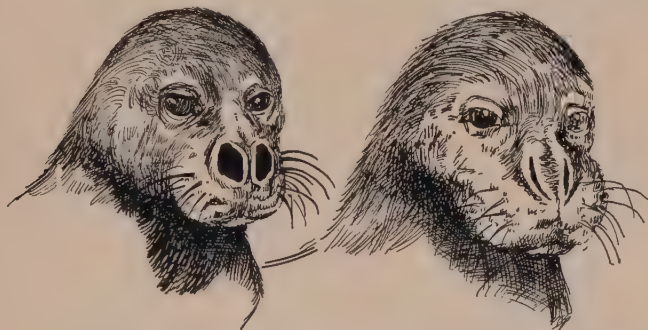
Bering Sea, notably the Pribilof Islands. The fur seals are highly gregarious and polygamous. Their life on those rocky isles in that far-off cold northern sea is very interesting. The old males, called bulls, arrive on the Pribilofs about the first of May. Each one picks out a place along the rocky shore for his home. By

June the females or "cows" arrive. They are received by the old bulls, each of which rounds up a herd for his property and "harem." These are settled on the place previously selected by the bull and defended against all comers. Sometimes a bull has as many as a hundred cows in his harem. The single pup — not calf — is born shortly after the arrival of the cow.

A little after the cows have appeared, the young bulls, called "bachelors," appear on the scene. They are forced by the old bulls to stay together and occupy a part of the island by themselves farther inland. Any old bulls coming with or after the bachelors are also forced by the first old

bulls to take up quarters just inside of the "rookeries." Their attempt to kidnap a cow now and then from the adjoining harems leads to desperate and uproarious fights among the old bulls, some of which end fatally.

The old bulls have to be continuously on the watch lest some of their cows are stolen. They are so devoted to their self-appointed task that they do not go into the water even to feed. The cows, too, are so devoted to their young



After Schmeil

FIG. 90. *Head of seal, showing how it can open and close the nostrils at will*

that they also abstain from getting food for several weeks, sometimes even starving to death. But when the young ones are finally able to accompany the old ones, then bulls and cows, much emaciated by their long fast, again take to the water and feed so heavily that they soon regain their former weight.

There is much disparity in size between the sexes, the males being six feet long, the females only three feet ten inches. The color is brown, and when the animals are old it is gray.

The herd on the Pribilof Islands has now dwindled down to three hundred thousand, from the several millions of



Photograph by A. R. Dugmore; courtesy Doubleday, Page & Co.
FIG. 91. *Sea lion barking*



Photograph by A. R. Dugmore; courtesy Doubleday, Page & Co.
FIG. 92. *Sea lion on a rock*

former years. The killing is now regulated by the United States government, and pelagic sealing—killing seals on the ocean—is forbidden. Only a certain number, say ten to twenty thousand of the bachelors, are killed annually for their pelts, which are very valuable. In 1917 skins to the value of \$274,291 were taken from the Pribilofs alone.

The greatest enemy of the fur seal is the killer whale. In the stomach of one of these, eight seals have been found



FIG. 93. *Walrus*

After Schmeil

at one time. The winter the fur seals spend in the north Pacific, coming as far south as the Hawaiian Islands and the coast of California, where they mingle with the sea lion and other species.

The sea lion. The seal often seen in zoölogical gardens usually is the sea lion, *California seal*, or *Gillespie's hair seal*, all names for one and the same species.

Seals are intelligent and can easily be tamed and taught many tricks, even difficult ones such as balancing a ball on the nose, and they are often seen in circuses. The voice of the seal is a hoarse barking.

The walrus. The walrus is a large ungainly creature, living in the north Atlantic and Pacific as well as in the Arctic Ocean. It reaches a length of ten feet and a weight of a ton or even three thousand pounds. The body of the walrus is fat, wrinkled, nearly bare of hair, and often has many pimples, sores, and boils. The walrus is not polygamous, but it is sociable. Herds of them can be seen lying on rocks or on cakes of ice in Hudson Bay and northward, basking in the sun or sleeping. The food of the walrus is mainly clams gathered in shallow parts of the ocean, starfish, sea urchins, and similar creatures that it may dig up from the mud with its large tusks, and also seaweed, of which it devours large quantities.

The walruses are peaceful and harmless creatures that will usually flee before man, but if wounded or angered they attack an enemy with their tusks, which are dangerous weapons. Their voice is a roaring and a grunting.

Earless seals. Among the earless seals the most common ones are the *harbor* or *leopard seal*, four feet long; the *harp seal*, so called from a pattern of dark color on the back; and the *bearded* and the *hooded seals*. All these are found in the north Atlantic, some also in the Pacific, often coming into harbors such as that of New York, and frequently ascending rivers that empty into the ocean. *Wedell's seal* is the only one living on the edge of the Antarctic continent.

HOOFED MAMMALS, OR UNGULATES

The order of ungulates derives its name from the fact that the animals forming it have one or more of their toes either partially or entirely covered with a tough horny shell called a hoof or nail (Fig. 94). In this order we find the largest land animals, the most useful domestic animals, and also the largest and most desirable game animals, such as

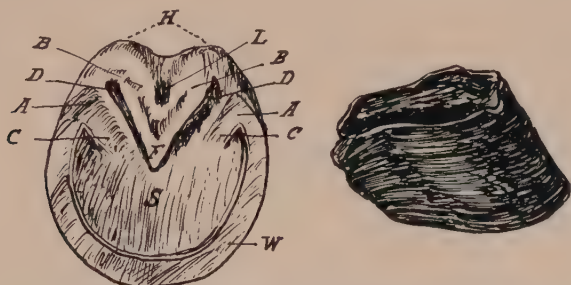


FIG. 94. *Hoof of horse, seen from below and from side*
H, heel; L, median lacuna; F, frog; B, branches of frog; A, angle
or buttress; C, bars; S, sole; W, wall; D, lateral lacunae

the deer. Some of the last, such as the buffalo, elephant, and antelope for example, have been brought to the verge of extinction, owing to their relentless persecution by man. Ungulates are found in all the continents with the exception of Australia.

The ungulates are herbivorous or plant-eating mammals. This makes necessary a tooth and jaw structure fitted for such a purpose. They have incisors or cutting teeth in front. A large group, however, the ruminants, have them only in the lower jaw. With a few exceptions they have no canines. The premolars and molars back in the jaw are their principal teeth. These are constructed for grinding

into pulp the plant food taken. Therefore they are large and flat-topped, with enamel ridges crossing them. The ungulates do not move the jaws up and down, but sideways and forward and backward.

In comparing the external appearance of the bodies of the carnivores and the ungulates, you will notice that the latter have a much thicker, rounder body than the former. The reason for this is that the flesh food of the carnivores has its food value concentrated in a small bulk, whereas the food values in plant food are scattered sparingly through a much larger amount of material. Therefore the stomach of herbivores must be larger, and the intestines correspondingly longer, because the nourishment cannot be selected and absorbed by the stomach alone, but this process must go on while the food passes through the intestines. Hence the big paunch of the horse and cow.

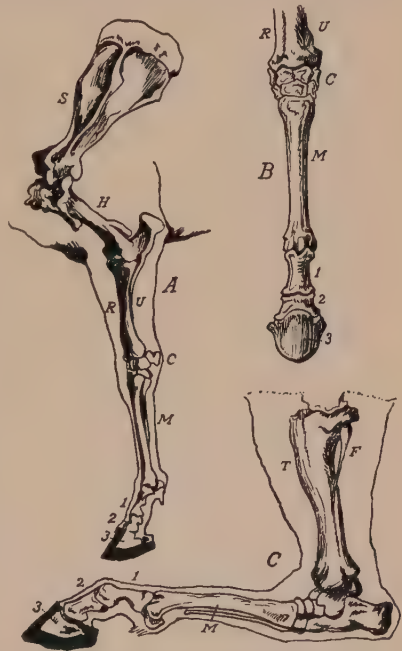
The following is a division of this large order which we shall follow here:

SUBORDERS	SUPERFAMILIES	FAMILIES
Odd-toed ungulates or perissodactyla	{ Horses Rhinoceroses Tapirs
Even-toed ungulates or artiodactyla	{ Non-ruminant artiodactyla } { Ruminant artiodactyla }	{ Pigs Hippopotamuses Oxen Sheep Goats Antelopes Deer Camels Giraffes
Ungulates having a trunk or proboscideans	{ Elephants

ODD-TOED UNGULATES, OR PERISSODACTYLA

HORSES

The horse. When Cortez landed in Mexico in 1519 with four hundred men to undertake the conquest of that unknown country, he had with him a number of horses. When the Indians saw the men mounted on them they became terror stricken at first, because they took horse and rider to be one being. From this we can see that there were no horses here at the time of the discovery of America. Later on, in the pampas of the Argentine in South America, and in the plains of Mexico and what are now our southwestern states, there were numerous herds of wild horses. Where did they come from? The Spaniards introduced domestic horses into those regions from Europe. Some of these domestic horses from time to time escaped from pasture, or were lost. They multiplied in those wide steppes and became practically wild or feral animals.

FIG. 95. *Legs of a horse*

A and B, foreleg, seen from side and front respectively; C, hind leg, drawn to show what part of a plantigrade mammal is on the ground. S, shoulder blade; H, humerus; R, radius; U, ulna; T, tibia; F, fibula; C, carpus or wrist; M, metacarpals and metatarsal; 1, 2, 3, finger and toe joints.



FIG. 96. *An Arabian horse with rider*

As far as history goes back, we find that the horse was a faithful companion of man, even going with him into battle. There is still a species of wild horse, the *tarpan*, existing in the plains and mountains of southwest Asia.

This has a larger head, thicker neck, longer hair, and shorter mane than the domestic horse, but it is swift of foot and wary in the extreme. Some of the Tartar tribes of that neighborhood, like the Huns of old, almost live on horseback. Horses are almost their only possession and stock in trade.

Almost every country has one or more races or breeds of horses peculiar to it. Here we have the Kentucky race



FIG. 97. *Molar of horse enlarged; skull of horse*

horse. In England there are the English coach horse and the race horse, the latter the greyhound among horses from its excessive leanness. In France and Belgium are the heavy Normandy and Percheron horses. The finest of all horses is the Arabian, which stands first in speed, appearance, and intelligence. In the Shetland Islands are small ponies, which have become dwarfed and long-haired because of the cold, raw climate and the lack of proper food. We have also the Morgan horse. The Texas, Oregon, and Indian ponies are small but tough and wiry descendants of the former wild plains horses.

The horse has large eyes, nostrils, and ears, indicating that its senses of sight, smell, and hearing are keen. The ears can be turned in several directions. As it also has long and strong legs, it can get away from most dangers. The hoofs are horny shells around the outermost part or joint of the third toe. Horses really walk on the tip of this one toe, and therefore we say they are digitigrade. The hoof is not so simple as one might think. The horse does not walk on the whole lower surface of it, but only

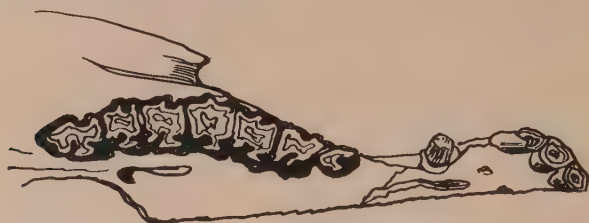


FIG. 98. *Right half of upper jaw of horse*

on the rim or edge of it (Fig. 94, p. 127). The various elevations on the lower side of the hoof are called frog, bars, buttresses, and wall. By means of these elevations, the horse is enabled to grasp any unevenness in the ground. The hoofs are also a means of defense, especially those of the hind legs. When a group of wild horses is surrounded by a pack of hungry wolves, the horses form a circle, with their heads in the center, and with their hind legs they strike at the wolves. The howls of many a wolf have thus been stilled forever. The joints in the middle of the legs are not knees, but the heel or ankle joints (Fig. 95, p. 129).

The size, strength, fleetness, and wonderful structure of the leg and hoof make the horse the best draft animal, although it is now being superseded by the automobile and the auto truck.

The food of the horse is grass, hay, corn, and other plant foods, so the teeth are arranged and constructed in accordance. In front are six incisors above and six below, with which he can cut off grass. Occasionally there is a small canine tooth next to the incisors. In the domestic horse the bit is put into the vacant space behind the incisors (Fig. 97, p. 131). On each side in each jaw there are six



FIG. 99. *Lower incisor of horse at various ages*
The figures indicate the number of years

broad, flat-topped pre-molars and molars with irregular ridges of enamel on the upper surface. Because it takes much grinding surface to grind all the plant food so large an animal must eat, the molars are large, forming long lines, hence the elongated shape of the head. From the gradual wearing down of the incisors (Fig. 99), horsemen can tell the age of a horse. The age a horse usually attains is thirty to forty years, though some grow older.

The tail of the horse is short, but that defect is compensated for by the long hair on it, which is of good service to the animal in brushing away its tormentors, the flies. What must, therefore, be thought of the practice of docking horses' tails?

The horse has a keen sense of direction, an ability to find its way home, if left to its own resources, even on the darkest night.

The *mule* is a hybrid between the horse and the donkey. When the sire or father is a horse stallion and the mother a donkey mare, the colt or young is called a *hinny*. The parentage of the mule proper is the reverse. The mule is preferable to the horse for many uses because of his greater hardiness, his immunity to disease, and his ability to endure greater heat.

The zebra. The zebra is another odd-toed ungulate having one hoof on each foot. It is therefore closely related to our horse. It is much smaller than the horse, has a long fleshy tail with a tuft of hair at the end, like that of the cow, and has larger ears and a larger head in proportion than the horse. The most striking difference, however, is in its color pattern. Most animals seem to have a concealing coloration, but here we apparently have one that must betray the animal to an enemy some distance off. Black and white close together cannot by any stretch of the imagination be called protective coloring. It is as loud as it can be. The ground color is white or cream and over this run stripes of black or brownish black. This color and pattern make the animal stand out very prominently in a zoölogical garden, but not so in its native surroundings. Not the color, but the pattern is here protective. Those black stripes running around the body, head, and legs cut up the outline of the animal to the eye, so that it becomes invisible at a comparatively short distance. This, therefore, may be called "protective pattern."

The zebra is a very pretty animal, but one quite difficult to domesticate. Those in captivity are vicious biters.

Zebras live on the plains of central and southern Africa. They are very gregarious, and range together in herds of from twenty or thirty to a hundred or more. Their principal enemy is the lion. The different kinds of zebras are the *mountain zebra*, which is found up to an elevation of eight thousand feet in the African mountains; *Chapman's*, *Burchell's*, and *Grevy's* zebras. The last is the largest and



FIG. 100. Zebra

After Schneil

finest of all in appearance. Grevy's zebra is about five feet high, the others only four.

The wild ass. The wild ass is smaller than the horse but larger than the zebra. It has larger ears than the horse, and a tail like that of the zebra. Wild asses are fine looking animals in their native habitat, sleek and smooth, swift of foot, keen and alert at all times. Their hoofs are small and dainty; therefore they are sure-footed in rocky places. They are more intelligent than horses. One, the *kiang*, is found in Asia, living in the same places as the tarpan or wild horse, between the Caspian Sea and the Himalaya Mountains. Another lives in eastern Africa.

The domestic ass or *donkey* is smaller than its wild cousins, also longer haired and more sleepy in appearance. But it is very sure-footed and at the same time strong;



FIG. 101. Wild asses and yaks on the "Roof of the World"

FIG. 102. *A black rhinoceros*

Courtesy Field Museum

therefore it is used as a carrier of burdens over rough, narrow mountain trails. For this it is used much in Spain, Palestine, Mexico, and South America. Here it carries people and bags of ore or other freight over the dangerous mountain paths where a misstep would mean being dashed to pieces hundreds or even thousands of feet below.

RHINOCEROSES

The rhinoceros. Rhinoceroses are huge, ungainly beasts. They belong to the odd-toed ungulates because they have three toes. These are not incased in hoofs like the one toe of the horse, but have rather large horny nails in front of each toe. The rhinoceros is a heavy animal, being from five to seven feet high at the shoulder. Because the body is so heavy, the legs are short and stout, without much shape, more like low pillars than legs. The skin is thick



FIG. 103. *The leopard's mistake*

This leopard was attacking a young Indian rhinoceros in the absence of its mother, when she suddenly returned and wreaked vengeance

and rough, so that the thorns of the jungle cannot hurt the animal. There is next to no hair, except possibly a little on the ears or on the end of the tail. The eyes are small and weak, so they cannot detect an enemy—which in their case can only be man—by sight, but only through scent. They are stupid animals, and not so dangerous as their size might lead one to think. In most cases they will run away before man, but there is something erratic about them; sometimes they will turn around again, provoked or

unprovoked, and charge furiously. However, as they are weak of vision and cumbersome in their movements, it is not very difficult to escape from them.

There are five species of rhinoceroses, three in Asia and two in Africa, the best known being the *Indian rhinoceros*.



Photograph by Akeley: courtesy Field Museum

FIG. 104. *An Indian rhinoceros*

Note the pleats or folds in the skin of this animal

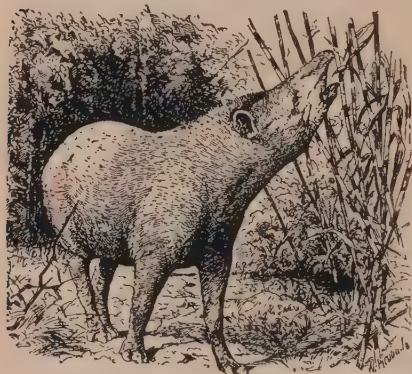
It is found in the jungles along water courses in India and the large islands south of Asia. It is often seen in zoölogical gardens or circuses; where it can at once be recognized by the fact that the skin seems to be hung on the body in square pleats or folds. It has one horn about twelve inches long on the nose. The name rhinoceros means "horn on nose."

The *white* or *square-mouthed rhinoceros* is the largest one of all. It is found in the plains of central Africa, and not so often in jungles. On the nose it has two horns, which are from eighteen to sixty inches long over the curvature. The female has the larger horns. The height at the shoulder is six to seven feet. The rhinoceros feeds on leaves of bushes

and trees, which it can very adroitly pull down and off by means of an elongated, prehensile upper lip.

TAPIRS

The tapir. The tapir is an odd-looking creature, apparently part pig, part rhino, and part horse. The snout is piglike, the legs horselike, and the body reminds one of the rhinoceros, although it is much smaller.



After Schmeil

FIG. 105. *An American tapir*

Tapirs are only three to four feet high. There are two kinds of tapir, the Malayan, living in southern Asia and the adjoining large islands, and the American tapir, which lives in South America. Both are inhabitants of the dense

jungles along the rivers. The tiger and leopard are the chief enemies of the Asiatic tapir, and the jaguar of the American. The jaguar often lies in wait for the tapirs on the limb of a tree. When a small herd or pack passes underneath, the jaguar jumps down on the back of one and tries to fasten his claws in the skin and body and bite through the backbone. But the terrified tapir is sometimes successful in passing below a low limb of a tree and scraping off its unwelcome rider. The tapir's skin is very thick, as is true of all jungle animals. This is to prevent laceration by thorns and branches. The American tapir is entirely black, whereas the Malayan has a wide white belt around the body. There are four toes on the front feet and three on the hind feet.

The hyrax. There is a small animal mentioned in the Bible under the name of coney, or cony (Leviticus, 11, 5; Psalms, 104, 18). It looks like a rabbit without ears. It is not a rodent, however, but according to its skeleton belongs to the ungulates. It is called hyrax. It lives in holes among the rocks in Palestine, Syria, and Abyssinia.

EVEN-TOED UNGULATES, OR NON-RUMINANT ARTIODACTYLA

SWINE

The members of the swine family are not built along lines of beauty, as in the case of the horse or deer. Neither is there a fine proportion between size of body and length of legs as in most other animals. Look at the domestic pig. The body is long and heavy, and the legs are short and not any too strong for the weight. The head is sharply pointed, ending in a disk, in which are the nostrils. The tail is small and curled. The swine are not covered with a dense coat of silky hair, but with bristles only.

Also, the habits of swine do not appeal to us. They all like to wallow in the mud, and it makes no difference how evil smelling that mud is. Their food habits also are not above reproach. They have all kinds of teeth—incisors, canines, premolars, and molars—therefore we can guess they are omnivorous. They eat almost anything, at least the domestic pig does—garbage, carrion, snakes, corn, clover—in fact, anything. Two or four of their incisors are tusks, particularly those of the boars, as the males are called, and these tusks are dangerous weapons. The boar's method of attack is to charge the enemy and upset him by the impact, then to tear open his vitals with those vicious tusks.



Photograph by A. R. Dugmore; courtesy Doubleday, Page & Co.

FIG. 106. *A collared peccary*

Pigs have a chambered stomach, something like the stomach of a cow, but they do not chew the cud. They walk on two toes which are incased in horny sheaths. There are two more toes higher up on the foot in a dwarfed form. Pigs are prolific, having from eight to twelve young, and in the case of domestic sows, as the females are called, even more. Occasionally they are cannibalistic and kill and eat their own young. The young are known as shotes.

The peccary. The peccary is the only wild pig within the limits of the United States, or, indeed, in the whole western hemisphere. It is found only in southwestern Arkansas and in Texas. In Mexico is to be found the *collared peccary*, and in South America the fierce *white-lipped peccary*.

The peccary is different from the pigs in several respects. Instead of many young at a time, it has but two. It has four toes on the front feet and three on the hind feet. Its length is only about thirty-four inches, and it has next to no tail. It is covered with dense, coarse hair, of a black and

gray color. It has a gland on its back which secretes an oily fat with a skunklike odor.

Peccaries occur in small herds of up to thirty individuals in the bottom-land woods, where they live on acorns, roots, mushrooms, wild fruit, carrion, and the like. It is said that they will sometimes attack a man, chase him up a tree, and wait below for a long time. But this seems to be a fairy tale.

The white-lipped peccary of South America, however, is said to attack men and even horses viciously and with little or no provocation, which seems doubtful.

Other wild swine. The half-wild *razor-backed hogs* or "rail-splitters" in our southern states are simply domesticated pigs which have been allowed to run at large and have reverted to a wild state. They are usually very lean, hence the name. They are said to be able not only to swim well, but to *walk* on the bottom of the rivers.

In the forests of Europe is found the *wild boar*, a large pig with enormous tusks. It is usually shy and wary, but when once wounded or otherwise angered it uses its last ounce of strength in trying to kill its enemy. A fit of rage comes over it in which it completely disregards danger to



FIG. 107. Skulls of wild boar (above) and of domestic pig (below)

itself. In this respect the wild boar is similar to some of the wild cattle.

In Africa is found the excessively ugly *wart hog*, so called from the large wartlike excrescences on the head. It has a few strands of long hair hanging over the face, which,



Courtesy Field Museum

FIG. 108. *Wart hogs*

Note the perpendicular position of the whip-like tail and the enormous tusks of the old boar

together with the huge tusks, make it a picture of ugliness, from our point of view.

HIPPOPOTAMUSES

The hippopotamus. The hippopotamus was known to the ancient Egyptians, as it formerly occurred in the Nile throughout its length, down to and including the delta. There the ancient Greeks learned to know it, and gave it the name by which we call it, hippopotamus meaning "river horse." How they could find in it any resemblance to the horse is hard to understand, as the hippopotamus is one of

the bulkiest and clumsiest of animals and has about it nothing at all of the gracefulness of the horse. It is uncouth in appearance, almost hideous, especially when it opens its cavernous mouth to yawn, which it often does. At the same time it is harmless, innocent, and timid.



FIG. 109. *Hippopotamuses* After Schmeil

Note the animal at the extreme right with nostrils, eyes, and ears above the water. The birds on the back of the animal on shore are looking for insects.

True to the other half of its name, the hippopotamus is never far away from a river, pond, or lake. In fact, it is usually in the water. All night long it feeds on the water plants in or near its home, but sometimes it wanders farther afield and gets into the fields or gardens of the natives and white settlers. There it does great damage, for it needs great quantities of food, and it tramples underfoot even more than it eats. In the daytime it lounges around in pools in the rivers, either entirely submerged or lying on a mud bank in the river or lake. Hippopotamuses are

sociable, herds of from twenty to thirty sometimes being found in one place. When submerged they come to the surface to breathe every two to seven minutes, but they can remain below water, if necessary, as long as ten minutes. They are four and a half feet high at the shoulder, and from ten to twelve feet long. They weigh as much as four tons. The legs are short, thick, and round, more like pillars than legs.

Despite its clumsiness the hippopotamus can swim well. And it is able to keep its body submerged and still see,

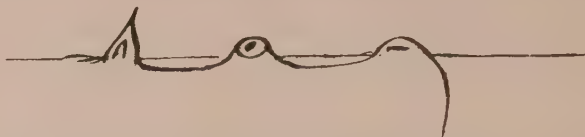


FIG. 110. *Head of hippopotamus submerged, with ears, eyes, and nostrils above the surface of the water*

hear, and breathe. This is accomplished by the arrangement of the ears, eyes, and nostrils, which are on elevations on the head. Thus the animal is enabled to keep its whole body and even its head below water, but have its ears, eyes, and nostrils just above the water line.

This interesting and harmless animal has been exterminated over large parts of its former range. It is now found in central Africa only, in the upper reaches of the Nile, in the Congo and its many tributaries, and in the lakes.

EVEN-TOED UNGULATES, OR RUMINANT ARTIODACTYLA

Ruminants are hoofed mammals that chew their food after it has once been swallowed, or, as it is also called, "chew the cud." There are two groups of them, the hollow-

horned and the solid-horned ruminants. To the former belong the cattle, sheep, goats, and antelopes; to the latter, the deer. Here we have some of our most useful domestic animals, as well as the leading game animals.

How is the chewing of the food accomplished after having been once swallowed? The animal cuts off a little bunch of grass by twisting its long, mobile tongue around it and then pressing the incisors of the lower jaw against it. That is why these incisors do not stand upward, but rather forward, in the jaws (Fig. 111), in order to bring their cutting edge against the base of the grass. That is why none of the ruminants have any incisors in the upper jaw. Just feel into the mouth of a calf or a cow the next time you have a chance!

In the mouth the grass is rolled into balls and then swallowed, passing into the first compartment of the four-chambered stomach, the paunch (Fig. 112, p. 148). From here the moistened and softened grass enters the second chamber, called the honeycomb or reticulum—the latter meaning net—because of its pitted surface or lining on the inside.



FIG. 111. *Head of ox*
A, skull of ox, the right horn taken off from the core; B, lower jaw; C, molar

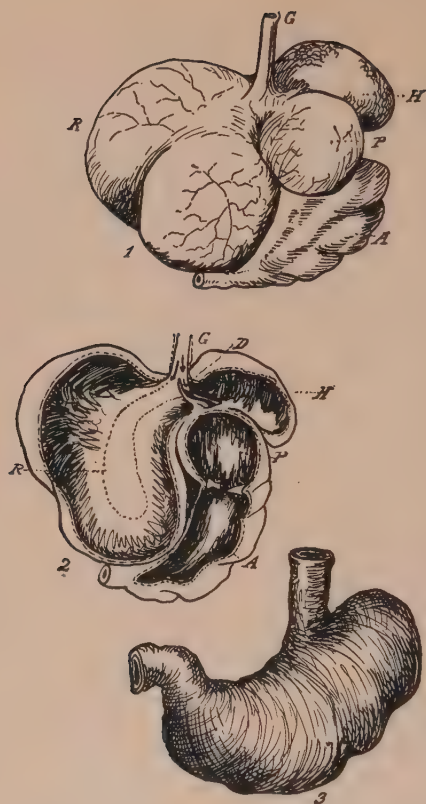


FIG. 112. *Stomach of an ox: (1) outside view and (2) cut open. (3) Simple human stomach*

The food cut off by the incisors in the lower jaw and the tongue is rolled into balls and passes through the gullet (*G*) into the first compartment, called rumen or paunch (*R*), thence through a connecting passage into the second one, the honeycomb or reticulum (*H*), thence back into the mouth, where it is thoroughly masticated (large salivary glands) and, passing once more through the gullet and a duct (*D*), it enters the third compartment, the psalterium or book (*P*), and finally goes into the abomasum (*A*).

From there the food is brought up again into the mouth and is chewed with the flat-topped, broad molars. The resulting green pulp passes into the stomach once more, but this time into the third chamber, called the book or psalterium, because the inside wall has many narrow, leaf-like ribbons attached to it. From here the food passes on into the fourth and last chamber, the abomasum, and finally into the extremely long intestine, where the difficult work goes on of extracting the nourishment from the large mass of plant pulp. It is because of this long intestine that these mammals have such large, round bodies.

Of what advantage is the ruminating habit to the animal? If it were compelled to chew while browsing, the eating process would require a

much longer time. There would be a much greater expenditure of strength in the animal standing for so long a time, aggravated by the fact that much of the browsing would have to be done in the hot sun away from all shade. This in turn would give its enemies a better chance to see it, sneak up upon it, and possibly kill it. As it is now, the ruminants can browse for a while and then lie down in the



FIG. 113. *A comparison of the molars of carnivorous and of herbivorous animals*

On the left are shown the carnassial teeth of a cat; on the right, the molars of an ox

shade under a tree, or, in the case of the deer, in a dense, hidden thicket, and there do their chewing in comfort and in safety.

The horns are hollow and set on a core of bone (Fig. 111, p. 147). They are not deciduous; that is, they are not shed from time to time.

OXEN

The bison or buffalo. It is only with feelings of keen regret that one can now write of the buffalo. The once

enormous herds that ranged over the vast prairies and plains of our country have dwindled to a few pitiful remnants in game preserves and zoölogical gardens. And these hardly have the dash and spirit of those of former years, when they roamed about in untrammelled freedom. The disappearance of the buffalo is a humiliating chapter in the history of the white race.

It was not the Indians who exterminated the bison. They levied a heavy toll on them, it is true, shot hundreds for food and often only to get the skins for tents and clothing, but that made little impression on the large herds. But when these buffalo robes became valuable in the eyes of white men, the process of extermination began, aided by the love of killing that possesses many people. This in turn was helped by the improvement of firearms in general. When the transcontinental railways were built, people went out West with their rifles, the train would halt in the midst of a large buffalo herd, and men would get off and try to outdo each other in shooting down these harmless animals merely to see who could roll over the largest number in the shortest time. Then they would get on the train again and go off, making not the least use of the slaughtered animals.

Nor has this murderous spirit disappeared from among us. Let a barn owl or a great blue heron appear somewhere, and the people hurriedly get out their guns and shoot these inoffensive and even highly useful birds, only to let them lie and rot. Any living thing notable for size or beauty, or both, arouses the lust for killing. It is high time we were getting over this savagery.

When America was first settled a few buffaloes were seen east of the Appalachian Mountains. But their real home was west of these mountains, in the great Mississippi basin

from Ohio westward. In 1678 La Salle, the French explorer, wrote about the country along the Illinois River as follows: "It is nearly all so beautiful and so fertile, so free from forests, and so full of meadows, brooks, and rivers, so abounding in fish, game, and venison, that one can find there in plenty and with little trouble. . . . Flocks and herds can be left out at pasture all winter; and there are even wild native cattle, which, instead of hair, have a fine wool that may answer for making cloth and hats. Their hides are better than those of France." In another letter occurs this statement concerning the same region: "These plains are covered ordinarily with wild cattle in prodigious numbers." Their number is estimated to have been from sixty to seventy millions.

About 1800 the bison had been cleared out of most places east of the Mississippi. Later still they roamed over the great plains east of the Rockies, from Great Slave Lake in the north to New Mexico and Texas in the south. The Indian with his bow and arrow could not make much of an impression on their numbers. Worse enemies were the ever-present hordes

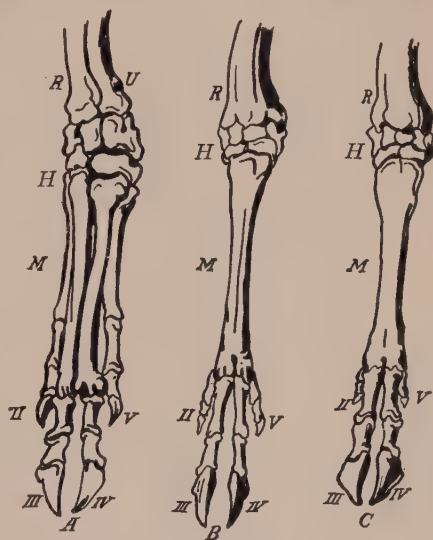


FIG. 114. Comparative formation of feet of artiodactyla: (A), pig; (B), deer; and (C), ox

II-V, toes; R, radius; U, ulna; M, metacarpals; H, heel, or wrist

of wolves, rotten ice on the rivers they had to cross, quicksand in the streams, and spear grass, whose seeds worked themselves through the wool into the flesh, causing much suffering.

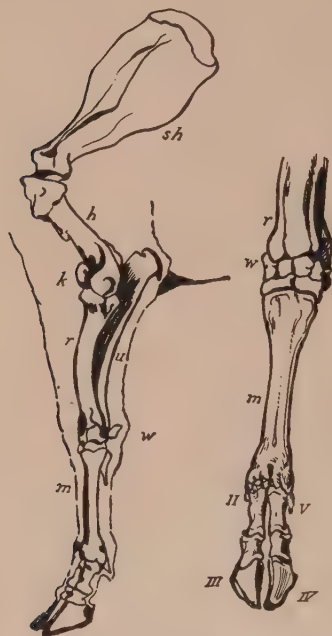


FIG. 115. *Foreleg of ox; side view at left, front view at right*

II-V, toes; *sh*, shoulder blade; *h*, humerus; *r*, radius; *u*, ulna; *k*, knee; *w*, wrist; *m*, metacarpals. Notice that the principal joint in the legs of horses or cattle is not the knee joint, but the heel and wrist respectively.

The buffalo was extremely sociable and gregarious. Only in the spring the cows would go off by themselves, looking for a sheltered nook, there to give birth to their one, rarely two, calves. After three or four days these would be able to run after the mothers, and they would rejoin the small herd, which was probably a clan of relatives. In the fall these small herds would unite and begin to wander south, getting larger as they went, until by the time they reached their southern or winter range, the compound herd numbered millions of animals. This was not a compact herd—that would have made feeding impossible—but an aggregation of small herds, with open spaces between them. As far as the eye could see were buffaloes. Here in the winter

range mating took place. The bulls, like those of our domestic cattle, were polygamous.

In the spring the herds would be seized by a restlessness and a desire to wander northward again. It was a mighty

movement. The very earth seemed to be in motion. They swam across the largest rivers. But farther north there would still be ice on some rivers. Often they crossed on this in safety, but sometimes it was rotten and went down with thousands of bison on it. Later their dead bodies would line the shores of the river lower down for miles, to the delight of coyotes and vultures, but to the despair of the settler, the explorer, and the trapper, owing to the stench produced.

In the late summer, prairie fires sometimes killed other thousands of buffaloes. Early travelers relate how they found their charred bodies strewn over the prairie, or some still living with their hair singed, or blinded by the fire, later to become a prey to the wolves.

Like the pigs, the buffaloes liked to wallow in mud. Where there was a pool or spring on the prairie they would roll around in it until it became a mass of ooze and mud. Thus the animal would be covered with a crust of mud, which served as a protection against the swarms of troublesome flies and gnats and against the seeds of the spear grass.

The buffaloes would find the shortest way to the water supply, and would use their paths over and over again, until these were worn down deep. In many places these buffalo paths later became the paths of the settlers, then the roads and highways. Still later the railroads followed them, because they were the shortest and easiest way through difficult territory, and had the lowest grade over the hills.

At mating time several bulls would sometimes fight for supremacy in the herd. At such times their bellowing and roaring could be heard for miles. The cows would utter deep grunts.

When wolves would attack the herd, the bulls would form a circle around the cows and calves. Many a wolf, ventur-



FIG. 116. *Bison, the monarch of the plains*

After Brehm

ing too near, would be hurled into the air by the horns of the bulls, and trampled into pulp when it came down.

Despite their large size the buffaloes were not what one might call brave, but rather dull-witted. One could shoot dozens out of a herd and the biggest bulls would stand by and look on, realizing neither what was being done nor

their own strength, with which they could easily have annihilated their enemies. Only when panic-stricken, if their anger or fear was aroused, would they stampede, and anything in the way, large or small, would then be trampled underfoot into a shapeless mass.

When in 1867 the Union Pacific Railroad came through as far as Cheyenne, Wyoming, the big continuous herd was cut into a northern and a southern herd. In 1871 the Santa Fé line cut through the territory of the southern herd, which melted down before the pitiless onslaughts of the pelt hunters and the railroad-coach sportsmen. In 1880 the Northern Pacific did the same thing for the northern herd. The last small herd of buffaloes in the South was seen and killed out in 1889 in Texas. The great plains became a charnel house, a field of death, covered with the bleaching skeletons of these great beasts. Finally, even these were gathered up to be made into fertilizer, and buffalo wallow and buffalo path were turned under by the plow and made into wheatfields. One herd has remained alive along the Peace River in northern Alberta, where it has a hard time to maintain itself owing to the depredations of Indians and wolves. It is a more wood-loving kind than the southerly bison was, and is therefore called the *wood buffalo*.

Another remnant of the once large herd is the herd in Yellowstone Park. Other herds in game preserves have been transported there.

The buffalo is eleven feet long, with a height at shoulder of five feet eight inches. There is a hump on the shoulder. On the head, neck, and forelegs is long, shaggy hair, forming a kind of mane. Horns are curved outward and upward. The head is held lower than the shoulders.

FIG. 117. *A musk ox*

After Brehm

In color the buffalo is yellowish brown above to grayish brown on the sides and the rear parts; the mane is purplish brown to black.

The name "buffalo" is wrongly applied to our animal, for the true buffalo is an Old World species of a different build and appearance, more like our domestic cattle. "Bison" is the proper name for our buffalo.

The musk ox. As among humans the Eskimo is known for his ability to endure great cold, so we have on our continent an animal that shares this ability with him and lives also in his country. This is the musk ox, a long-haired, shaggy little ruminant that seems to be part bison and part sheep. The male is very rank with a strong musky odor; hence the name.

These animals live north of the arctic circle, in the arctic barrens and tundras, where one would suppose an animal

the size of the musk ox could find hardly enough food in summer, let alone in winter, or, if they could maintain themselves in summer, that they would migrate south in winter, as the bison did. But they do no such thing. The sparse grass and plentiful supply of moss and lichens furnish them with abundant food in winter as well as in summer. In winter they paw away the little snow that falls in these regions of intense cold.

The musk oxen live together in small herds, and protect themselves against the icy blasts of the long arctic winter by huddling close together on the leeward side of a hill or rock. They are six feet long, and three and a half feet high. Their horns are like the bison's, except that they are smaller. Otherwise they look much like sheep. The color is black above and on the sides and yellowish white below and on the legs.

The musk ox is found in arctic North America only, east of the Mackenzie River, north of the arctic circle, in Greenland, and on the islands north of Canada.

Other oxen. In the rugged, inhospitable Himalaya Mountains in Tibet is the peculiar *yak*, or grunting ox. Tibet is called the "roof of the world," because here the floor of the valleys is from twelve thousand to sixteen thousand feet above sea level. Therefore, as a protection against the intense cold of this great altitude, the animal is covered with long hair, reaching down to the ground on the sides. Even the tail is hairy, like the tail of a horse rather than that of the ox. The yak has a hump over the shoulders, a long body, and it carries the head low. Its voice is a grunt, hence the name. It lives on the sparse grass, moss, and lichens of those high places. The picture on page 136 shows a group of yaks feeding on lichens.

The yak has been domesticated by the Tibetans, who could hardly exist without it. They make the utmost use of it, both living and dead. They ride on it and use it for carrying freight and to draw their rude plows. They use its milk, from which they make the butter that is their



After Brahm

FIG. 118. *A yak, or grunting ox*

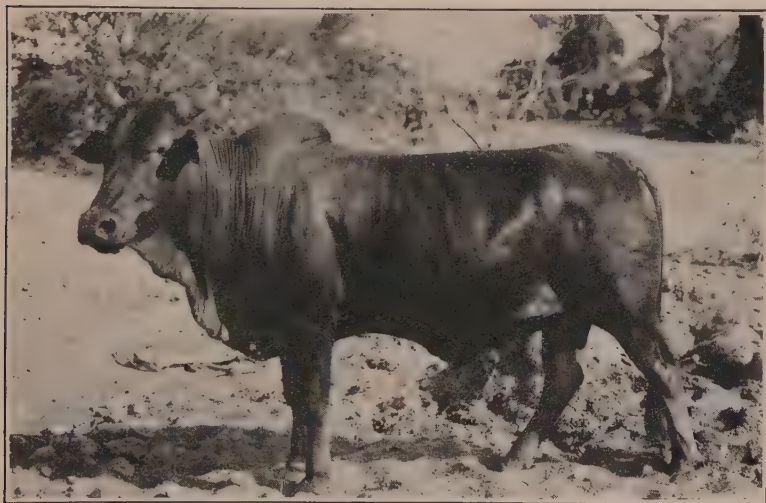
Note the tail, which is like that of a horse, and the long hair on the side of the body

main food. In Lhasa, the capital of this odd country, they keep the yaks in the lower story of the houses, while the people live above. But there are also herds of wild yaks living in the mountains.

In India, south of Tibet, and in Egypt are found the *zebuses*, or humped cattle, as domesticated animals. They are fine, sleek animals, of delicate brown or gray colors, like our Jersey cattle, but larger. The zebu has a hump over the shoulders, not a rounded one like that of the bison,

but one hanging backwards. This animal is held sacred by the Hindus, just as it was by the ancient Egyptians.

The *water buffalo* is used extensively in the tropics, in Africa, Asia, the Philippines, and even in southern Europe. It is easily domesticated and much used for work in the



Courtesy Field Museum

FIG. 119. *Bull of zebu, or humped cattle, the most sacred animal of the ancient Egyptians and of present-day Hindus*

Note the long dewlap on the lower side of the zebu's neck

rice fields and other wet, muddy, or swampy places. The largest and fiercest of this family is the *Cape buffalo* in southern Africa. This is a large, strong, massive animal with enormous horns which meet over the forehead. It is considered the most dangerous beast in Africa, for in the dense jungles where it lives it cannot be seen for any distance, and one cannot get away from it. When it has made up its mind to charge, nothing will turn it from its purpose, and, like the wild boar, it will use its last ounce of strength



Courtesy Field Museum

FIG. 120. *Cape buffaloes of South Africa, a variety of the water buffaloes*

to undo its supposed or real enemy. When they are domesticated, however, a child can drive a herd of fifty water buffaloes.

SHEEP

The sheep are ruminants like the oxen or cattle, but smaller, and with curly hair called wool. The males are termed rams; the females, ewes; the young, lambs. The rams have spirally wound, hollow, corrugated horns with which they defend themselves and their families. They run against and batter down the object of their anger.

The mountain sheep or bighorn. In the most inaccessible places, along the crests of the Rockies, Sierras, and Cascades, lives the splendid mountain sheep. It feeds on the scant herbage found between the timber line and the snowfields. It is an extremely graceful and skillful climber and jumper, and is very sure-footed. Its two hoofs or toes are closed in front, whereas those of the mountain goat are open. Where other animals could not move, without dropping off to sudden death, along the edges of deep chasms or up and



Photograph by A. R. Dugmore; courtesy Doubleday, Page & Co.

FIG. 121. *Bighorn, or mountain sheep*

down the nearly perpendicular cliffs, the bighorn moves as though it were on a wide boulevard.

The bighorn has keen scent and good sight, and can detect an enemy at a great distance. By the time the hunter succeeds in getting near to where he saw the sheep before, they are far away. Therefore it is considered a proof of great endurance and skill in climbing as well as in the use of the rifle to secure one of these fine animals, especially a ram. These have the big horns, beautifully wound and corrugated, which grow to fifty inches along the curvature, and to fourteen inches in circumference at the base. The ewe has only small, slightly curved horns.

Each ram has two or three ewes, and to each ewe are born one or two lambs, to which the mother is very devoted. In winter the bighorns come lower down on the mountain sides, or even into the valleys. The panther, wolf, and bobcat are, next to man, their principal enemies. A better way than to kill them is to try to take pictures of them in their wild state. That takes even more skill and endurance than the shooting, and the pictures are much better trophies.

The bighorn is four and a half feet long, and three feet four inches high at the shoulder. Its wavy hair is closely appressed, the color a grayish brown, with the rump, the under parts, and the inside of the legs white.

Dall's mountain sheep in Alaska and Yukon Territory is nearly pure white.

Other sheep. In the mountains and on the plateaus of Asia lives the *argali*, even finer and larger than the bighorn, a variety of which is the famous *Marco Polo sheep*, named after the great traveler of that name. It has the same kind of horns as our bighorn, but they are larger. In Persia and Syria is found the *fat-tailed sheep*, which has

such a heavy tail of fat that people fasten a little cart to the animal for the tail to be carried on. In Iceland and on



Courtesy Field Museum

FIG. 122. Head of Marco Polo sheep of Asia, a variety of the argali

St. Kilda Island are domestic sheep of which the rams have four intertwined horns.

The finest domestic sheep is the *merino*, raised extensively in Spain, but now raised also in America. This sheep produces as many as ten pounds of wool to the animal.

GOATS

Another family of ruminants, the goats, have for the most part straight hair, though a few have wavy hair. Both sexes have beards, and there is a strong, disagreeable odor about them. The males are called bucks or billy goats; the females, goats or nanny goats; and the young, of which one or two are born at a time, are called kids. Goats are excellent climbers, and can subsist on little and poor food; therefore they are extensively raised in rocky and mountainous places where cattle could not find a footing or sufficient food. The horns of the goats are not wound, but rather straight, with a slight curve backward.



FIG. 123. *The end of an African chase*
Observe the ostriches, zebras, and gnus and various other antelopes

The mountain goat. The mountain or white goat is found in the same kind of places as the mountain sheep, but its range is more restricted. It occurs only in the northern Rockies and Cascades to Alaska. It is found in small flocks on and near the snowfields, but it is not so keen and wary as the bighorn, therefore more readily approached and secured by the hunter. Both sexes have horns. The head is slender and is carried low. The long hair is pure white both in summer and winter, this being one of the few pure white animals. The two toes or hoofs are apart in front.

Four feet long and three feet high at the shoulder, the mountain goat has hair long and straight, with short woolly underfur. Its horns are slender, black, and slightly curved backward.

Other goats. The finest of the wild goats is the *ibex*, found in the same places as the argali. It has large, thick, corrugated horns, slightly curved backward. Its hair is reddish gray in summer and yellowish gray in winter.

The finest domestic goat is the *Angora*, a close relative of the *Cashmere goat*. Both have long silky hair, from which the Cashmere shawls are made. They have now been introduced into America.

ANTELOPES

The antelopes form the largest and most diversified family of hollow-horned ruminants. Some are so much like goats that they might be considered as such; others are as large and as heavy as an ox or a horse. Likewise there is almost an endless variety in the size, shape, and texture of their horns. In this respect some resemble deer, except that the horns are not solid. All have hollow horns which

are set, like those of cattle, sheep, and goats, on a bony core. With the exception of our pronghorn, the horns are not shed yearly.

Many antelopes are dainty, graceful, nimble, and agile creatures, others are heavy and apparently clumsy, the



After Schmeil

FIG. 124. *Some antelope heads*
Top, blackbuck of India. Bottom row,
hartebeest of South Africa; waterbuck of
India; oryx antelope of Africa

majority being of slender, deerlike build. The principal home of the antelope family is Africa, which harbors the greatest number of species and individuals of any continent, from the little *dik-dik* and *klipspringer*, two feet high and with legs not much thicker than a pencil, to the *gnu* and *eland*, which are as large as horses. Both

sexes have horns, and a tear sac in the corner of the eye. They are very sociable and gregarious.

The pronghorn. The pronghorn is one of our most interesting animals and at the same time the only antelope in the western hemisphere. Like many of our larger mammals, it is rapidly vanishing, and only the most rigid protection can save it from early extinction. It is a nimble, fleet-footed animal of our western plains and arid plateaus, over which it skims with the speed of the wind. It is a sociable, playful animal, but at the same time wary and timid, for besides man as its most dangerous enemy, when he should be its friend and protector, the pronghorn has to cope with the savage voracity of the wolf, the coyote, and the panther.



Photograph by A. R. Dugmore; courtesy Doubleday, Page & Co.

FIG. 125. *Heads of male pronghorns*



Photograph by A. R. Dugmore; courtesy Doubleday, Page & Co.

FIG. 126. *A male pronghorn*



FIG. 127. *Pronghorns in Arizona*

Courtesy Field Museum



Telephoto by W. E. Carlin; courtesy Doubleday, Page & Co.

FIG. 128, *Pronghorns*

The animal on the right is "flashing his signal" by elevating the hair on the rump

Sometimes a deep snowfall or a blizzard reduces its already diminishing numbers, especially in the northern part of its range, which extends from Saskatchewan to Mexico and from the Missouri River to Washington and Oregon.

Both sexes of the pronghorns have horns, which are shed yearly. In this characteristic it is an exception among hollow-horned ruminants. Nor do the horns grow over a bony core, but, strange to say, they are formed by a fusion of the hair. The horns have a prong, hence the name given to the animal.

The pronghorns live together in herds of from six to thirty, the bucks being polygamous. When browsing they are very watchful, an old one acting as sentinel and eyeing the surroundings carefully and sniffing the air for any tell-tale taint of dog or man. Their eyes are large, indicating good sight. When anything suspicious is noticed, they suddenly raise the hair on their rump, which is pure white, and this produces across the landscape a clearly perceptible flash that can be noticed by herds quite a distance away, as Ernest Thompson Seton has lately observed. Those that see it also give the flash and soon are on the move away from the place from whence the fatal odor seems to come. They fairly skim over the ground. But after a while they

stop to look around and see what it really is that has scared them.

Pronghorns are very curious. If a hunter, crawling on hands and knees, will tie a rag or a handkerchief to a stick and hold it up over the grass, the animals seeing it will be overcome by their curiosity. They want to know what this strange thing is, and approach closer and closer. Suddenly



After Schmeil

FIG. 129. Chamois in flight; left foot, showing hoof from the under side

the rifle speaks out and one of their number pays for his curiosity with his life.

The pronghorn is two feet ten inches high at the shoulder and four and a half feet long. The color is a light yellowish brown that is indistinguishable in the surrounding brown of the plain. The throat, neck, under parts, side of head, and a spot behind each ear are white, as is also the rump, which serves for giving heliographic signals.

Other antelopes. The *chamois* (pronounced *shammy*) is one of the most celebrated of antelopes. It is found in the highest mountains of Europe, but is best known from

the Alps. In summer it is of a dull rusty brown, and a glossy brownish black in winter. It stands thirty-two inches high at the shoulder. The horns, borne by both sexes, are small and sharply recurved near the tips.



FIG. 130. *Chamois*

After Brehm

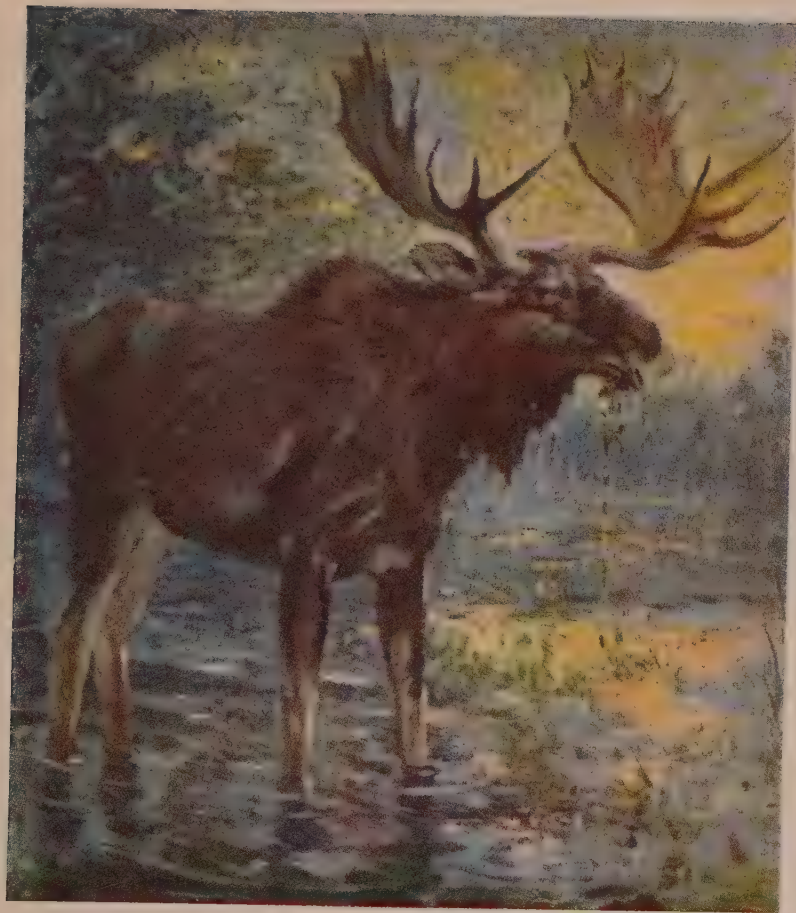
The chamois occur in small flocks in nearly inaccessible places of their mountainous home. Their fearlessness, agility, and endurance are truly remarkable. They will, when necessary, jump twelve feet straight up, or twenty feet across a chasm, from a jumping-off place perhaps no larger than a hand. The chamois skin of commerce, of course, was never on a chamois but, instead, is the prepared skin of goats and sheep.

DEER

The deer are the solid-horned ruminants. They are the most showy of the ruminants, beautiful and graceful and built for speed. The lithe and well-proportioned body is set on thin but strong and graceful legs. They have two toes or hoofs, with two small, rudimentary toes a little higher up, which, no doubt, often keep them from slipping when going at full speed. The principal colors are various shades of brown and gray, though there is some white. The fawns are beautifully spotted with white, but these spots disappear as they get older, except in the case of the *axis deer* of India and some of the *fallow deer* of Europe.

As ruminants they have a four-chambered stomach, chew the cud, and have no incisors on the upper jaw. We can see how useful to the animal this arrangement is. If a deer were obliged to stand out in the open glade, cropping off grass which it must chew on the spot, how much longer would it have to stay there, exposed to the view and attack of possible enemies! Grass eaters need large quantities of food to satisfy the demands of their stomach. But with this arrangement they can hurriedly tear off a great many bunches of grass, fill their paunch with them, and then retreat into the friendly recesses of the forest, lie down under a sheltering bush in a thicket, and there chew their food in safety, peace, and comfort.

Males of the deer are called bucks; females, does; and the young, fawns. The most attractive thing about deer is the antlers, their much-branched ornamental headgear. These consist of solid bone, therefore the name "horns" is not the proper term for them. With the exception of the caribou and reindeer, where both sexes have antlers, only the bucks have them. In some species they reach an



Courtesy *Nature Magazine*, Washington, D.C.

FIG. 131. *A Yellowstone moose*

enormous development and attain great weight. But in spite of this they are not permanent, as are the horns of cattle, but are shed every year. One would expect the hollow horns of cattle to be shed rather than the ponderous headpieces of the elk and moose. They are shed variously from December to March, leaving a roundish knob on the skull. They soon begin to grow again, and in May and June growth is remarkably rapid. During growth the antlers are covered with a velvety skin, crossed by many veins which carry the material for their upbuilding. By the end of September the antlers are again as large as or larger than those shed. The tines and prongs are properly finished off and so the "velvet" dries and peels off.

What then is the purpose of these structures which they keep for so short a time? They are an ornament, and an instrument for sparring, or for the encounters of the bucks during rutting or mating time, which is in October and November. Then savage fights take place between the bucks of a neighborhood for the possession of certain does, for deer are polygamous.

The moose. We were paddling through the "inlet" between Bass and Loon lakes in Quebec. It was a fine day in July. Not a breath of air was stirring as my companion plied his paddle noiselessly. On our left was a wall of cat-tail, beyond which was the ever-present fringe of alder, white birch, and the pointed black spruce so characteristic of the Canadian landscape. In the water were large and small fishes disporting themselves. Floating above them were the leaves and flowers of water lilies. There was a bend in the inlet, and I got up to look across the cat-tail to see if anything of interest might be visible beyond. My eyes opened wide, and I sat down quickly, for there, not

more than two hundred feet away, stood a bull moose, contentedly munching away at lily pads. I whispered to my companion what I had seen and told him that he should



FIG. 132. *A moose feeding on lily pads*

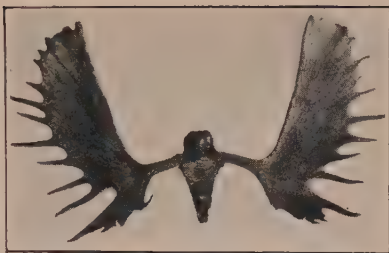
try to get closer without making any noise. This he did, and I succeeded in taking several pictures.

At first the moose seemed scarcely to see us as he looked at us in a blinking, sleepy, dull sort of way. Finally, when we were only about fifty feet away, he noticed us and, not too hurriedly, made his way out of the water and into the friendly darkness of the wood. At this time the antlers were a third grown and in the velvet.

At this stage the moose makes a rather sorry figure. He is an awkward, clumsy looking animal, with his huge bulk, long spindling legs, ungainly large head with the bulky rounded muzzle or nose, the large ears, the hump over the withers, and with the rather thin hind quarters and small tail.

The moose is the largest deer in the world, reaching a height of from six to seven feet at the shoulder. The largest moose are found in Alaska, where the record for size is held by one that measured seven feet eight inches at the shoulders. Then there is the large head to be considered, with the enormous palmate or shovel-like antlers. These have a spread at times of from fifty to seventy inches from tip to tip, the largest, again from Alaska, measuring eighty inches. And all this solid bone! What a weight to carry!

This monarch of the forest is a very different creature in the fall and winter from the one we saw on that warm July



Courtesy Field Museum

FIG. 133. *Antlers of moose*



Courtesy Field Museum

FIG. 134. *A moose*

day. By the end of September his broad antlers are fully grown, and the velvet drops off. He shakes off his lethargy if he had any, his step becomes bolder, his eyes more lustrous, and he snorts and grunts. Now he goes out at night into a glade or opening in the woods, and calls out his challenging *Oh-ah, oh-ah, oh-ah!* This means that any bull that may be within hearing is invited to come out and fight with the challenger for the possession of the near-by cow moose. The cow also has a call, which sounds something like: *Who are you?* The call of the bull can be heard as far as four miles in the silence of the northern night.

Suddenly another bull will answer the challenge, and his call may be heard coming nearer and nearer. Finally he enters the clearing where the first challenger has stationed himself. Then and there a fast and furious fight begins which may last an hour or more. The huge animals charge at each other and spar with their massive antlers, behind which is the weight of a thousand to fifteen hundred pounds. The quiet of the night is broken by the loud clanging of the antlers and the snorting and bellowing of the now thoroughly infuriated animals. Usually, the moose that feels himself the weaker of the two will finally run away, but sometimes one remains dead on the field of battle, which is torn up as though a tornado has passed over it. In this, their rutting or mating season, a bull moose will sometimes attack a man, even unprovoked, as the following incident shows.

A prospector was peacefully trying for gold or silver ore in the forest near Cobalt, Ontario, Canada, when he was suddenly charged by an angry bull moose. Fortunately for the man, a fallen tree was right there, below which he hurriedly threw himself. The infuriated moose went from

one side of the tree to the other in his efforts to get at the man. After an hour or two of this hide-and-seek game, the big animal went away, much to the relief of the harassed prospector.

The moose do not attack with their antlers so often as they do with their front feet, with which they try to stamp out the life of a prostrate foe. As a rule, moose are timid and wary and will run before man. Their acute scent and hearing, coupled with their speed, enable them to escape most enemies. But how can they make much headway through the dense forest, with those huge, branching antlers apparently so much in the way? Because the antlers are held back over their withers, so that all branches coming in contact with them readily slide off on the outside instead of being caught between the tines.

In December, January, or February the antlers of the bulls drop off. When this is about to happen, they go to a swamp or some soft springy place and stamp the fallen antlers into the muck. That is the reason their antlers are so rarely found. The same thing is done also by the wapiti and the white-tailed deer.

When there is deep snow in winter, several moose will associate together and make a so-called moose yard—that is, they trample down roadways through the thicket or swamp where they intend to stay for the winter because of the plentiful food supply to be found there, until the trampled-down snow forms a more or less circular area. This is the only time in the year when the moose is inclined to be sociable; otherwise it is solitary. The cow is followed by the last and second-last of her young. It is probable that some moose round out their existence within ten to twenty miles of the place where they were born.



Photograph by A. R. Dugmore; courtesy Doubleday, Page & Co.

FIG. 135. *A pair of bull moose in a stream*
Their antlers are now in the "velvet"

In summer the food of the moose consists of the succulent leaves and "pads" or stems of the water lily and other juicy herbage. In fall and winter, it is twigs, bark, and buds of bushes and small trees. They straddle a sapling or a small tree with their front legs, bend it down, and chew and bite off the twigs at the end.

The color of the moose is blackish brown, with gray on the head, legs, and belly. Both sexes have a so-called "bell," a tail-like appendage of skin and hair dangling from the throat. Usually it is about eight inches long, but one has been found that measured thirty-eight inches. It disappears with old age. The calves are born in May or June, and are one or two in number.

Unlike the bison, bear, elk, deer, and others, the range of the moose has not been decreased to any extent by the settlement of the continent. The animal is still to be found



Photograph by A. R. Dugmore; courtesy Doubleday, Page & Co.

FIG. 136. *Elk stag and herd*

where it always has been found. Yes, it is even increasing in numbers of late, owing to the strict protection given to it. It ranges in the large forests of Nova Scotia, New Brunswick, Maine, Quebec, and Ontario to Manitoba and northern Minnesota. Where the prairie begins, the moose disappears, to reappear again where the forest commences in Alberta, then through British Columbia into Alaska, where it attains its largest size.

The wapiti or elk. While the moose is the largest and bulkiest of all deer, the wapiti or elk is the stateliest and the largest of those having round antlers instead of the flat or palmate ones of the moose. But though the moose has only one cow (monogamous), and the elk is highly polygamous, yet the latter has disappeared over most of its former range.



FIG. 137. *A battle royal in central Europe*

Stags fighting for supremacy of this part of the forest and for the possession of the watching does

The first explorers and settlers in the eastern part of our continent all report the wapiti as common everywhere, while now it is confined to a comparatively small portion of its former range. It is now found only in our western mountains from New Mexico and Arizona in the south to Alberta in the north. A few are found in California, Oregon, and Washington. Their metropolis at present is Yellowstone Park and the adjoining Jackson Hole country. No longer do the forests and valleys of Pennsylvania, Michigan, Kentucky, or Missouri resound with their "bugling," as they did seventy-five or a hundred years ago. Another monument to the stupidity, greed, and cruelty of the white man!

The elks' color matches well with their mountain habitat, being yellowish brown above, blackish below, with the chest, neck, and legs dark brown, and the rump whitish. In winter their hair is, of course, longer, denser, and grayer. In the Jackson Hole country, immediately adjoining Yellowstone Park on the south, thousands of elk may be seen in the fall coming in small herds from the mountains into the valley. The small bands are not led, as one would expect, by an old buck or bull but by an old doe or cow. Many elk formerly died in this valley during the winter because the vegetation was not sufficient to support a herd of five to ten thousand, their gregariousness having overstepped the limit of safety. But now the federal government, through its bureau of biological survey, feeds them hay all winter, as is also being done in Yellowstone Park.

In September the antlers of the bucks have fully grown, and the "velvet" drops off. The antlers are truly enormous, being fifty to sixty-five inches high, much branched, and at the base covered with pearly knobs. Fall is the rutting

or mating time. The bucks come down into the valleys to gather to themselves a number of does. At night they come out onto a knoll in the valley and bugle their challenge into the air. Another buck comes to accept it, and to dispute with the challenger the possession of the bevy of does near by. They clash and close in furiously, their antlers rattle, they paw the ground, and force one another to their knees, until finally one is thrown down. They clinch again and again with great fury, their weight of six hundred to eight hundred pounds making their onslaughts very powerful. The fight continues until one is killed or seeks safety in flight. Unfortunately there is sometimes still another ending—a tragedy. Occasionally the antlers interlock so that they are unable to separate them again. They must then stay together with their heads held fast until hunger or a pack of wolves ends their misery. A number of such interlocked antlers have been found over the range. The same thing happens sometimes to the moose and Virginia deer.

As the sun becomes warmer in the spring and the snow banks disappear, the herds of elk again wend their way out of the valleys and up into the mountains. The does and young of the previous year remain in the upper valleys, the bucks going still higher into the mountains. The latter lose their antlers in March. The does soon search out a little protected gully or a thicket of brush or grass, there to give birth to one, two, or three young. After a few days the fawns are able to follow the mother back to the little herd or enlarged family.

At first the fawns are marked all over with pure white spots, but these spots disappear when they grow the first winter pelage.

The call of the wapiti is a sweet, loud, birdlike note called "bugling," one hardly to be expected from so large an animal. The elks have two small, tusklike canines in



FIG. 138. Upper left: shed antler of deer seen from below; lower left: core of bone where broken off; right: left forefoot of deer

R, radius; C, carpus; M, metacarpal; II-V, toes

the upper jaw. The animal is from four to five feet high at the withers, and seven to nine feet long.

Here is the story of the growth of their large antlers, as told by Ernest Thompson Seton:¹ "At first the place of each antler is a broad raw spot. A few days later it shows a thick rounded pad of blood-gorged skin. This swells rapidly and, in a fortnight, the great, bulbous, fuzzy young antler-beginning has shot up to a height of several inches. At exactly the right time and place, and in just the right direction, a bump comes forth to be the foundation of the

¹In *Life Histories of Northern Animals*, Vol. I, p. 55.

brow tine. In a few days the bez- tine is projected by the invisible architect. In a month the structure is nearly a foot high and all enveloped in a turgid mass of feverish throbbing blood vessels—the scaffolding and workmen of this wonderful structure. Night and day the work is pushed with astounding speed, and in four months this ‘skyscraper’ is finished. A marvel, indeed; an edifice that, according to ordinary rules, would have taken a lifetime, and yet it has been rushed through in a single summer. Their growth is one of the works of nature that we never cease to consider a miracle.”

The white-tailed or Virginia deer. While walking at dusk along the edge of one of the many small bogs surrounded by wooded hills near one of the backwoods settlements in Quebec, we were suddenly startled by the crashing of a twig a little ahead of us. Looking in that direction, we saw something white floating away over the high-bush huckleberry and other shrubs into the shelter of the wood. It was a white-tailed deer. When running away these deer hold their large tail upright, so that the white underside of it looks like a white flag; hence their name. They are such expert runners and jumpers that one hardly notices that they touch the ground with their feet. It is done so quickly, and gives them such a bounce forward, that they seem to be fairly gliding or flying over bushes, logs, and fallen tree tops.

Once when coming home from a long tramp through the beautiful north woods and bogs, we entered a clearing covered with fine grass and there came upon six deer peacefully browsing. When they saw us they moved away at a leisurely walk. They know when the hunting season is on and when not.



Courtesy Field Museum

FIG. 139. *White-tailed deer in the spring*

The deer have no antlers at this season



Courtesy Field Museum

FIG. 140. *White-tailed deer in the summer*

Now the skin or "velvet" covers the nearly full-grown antlers



Courtesy Field Museum

FIG. 141. *White-tailed deer in the autumn*
Here the buck is rubbing off the skin from his antlers



Courtesy Field Museum

FIG. 142. *White-tailed deer in the winter*
The antlers are now fully grown

When you paddle your canoe on a river or on a water course connecting two lakes, or on one of the many lakes of the north country, you will frequently see, as you round a bend, one or more of these graceful creatures standing in the water or at the edge of the forest at the head of a little bay. They will look at you with their large, liquid, wondering, and innocent eyes, then leisurely, or sometimes hurriedly, make off.

The white-tailed deer, like the moose, are fond of water lilies and of standing in the water to rid themselves of the tormenting mosquitoes, black flies, deer flies, sand flies, and other such vermin that make life miserable for man and beast in the northern woods. There is another reason, too, for their liking to be near water. When their archenemy the wolf, or a lynx, attacks them, they can plunge into the water, where they are safe, as they are expert swimmers. The water also leaves no track to be followed by scent. On land, too, they can outrun the swiftest wolf, for they easily can make twenty-five miles an hour, but unfortunately they have the fatal habit of running in large circles, which the wolves seem to know.

In summer the color of the white-tail is a glossy reddish brown, with white on the under parts. Then the bucks are growing their antlers, which has the same effect on them as the molting of feathers has on birds. They are secretive and ill at ease. But when October comes—the “mad moon” for the wild things—when their antlers are perfect, notice how proudly your buck steps forth, and how his neck swells, and now his eyes are no longer furtive, but flashing. Now he selects two or three does for himself, for he too is polygamous, but not to the same extent as is the wapiti. At this time he engages in savage encounters

with other bucks for the affection or loyalty of his does. In fact, so demonlike a fury seems to take possession of the males that they will not hesitate even to attack man. There are cases on record where deer kept in an inclosure have actually killed people, first throwing them down with their antlers and then quickly trampling them to death with their strong and sharp-hoofed front feet.

The white-tailed deer is about six feet long and three to three and a half feet high at the shoulder. The antlers grow forward, the tines growing upward from the main stem. They grow to be twenty to twenty-four inches long, measured along the curvature. It is an error to suppose that the age of a buck can always be told exactly from the number of tines in the antlers. Sometimes an old buck will have smaller antlers and fewer tines than one that is younger. The bucks shed their antlers in December.

The white-tailed or Virginia deer is found from the Peace River, Alberta, and the southern half of Ontario and Quebec through the New England States, down the wilder parts of the Appalachian Mountains, the Carolinas, and into Florida, thence west through the Gulf States into Texas and Mexico, where they are of a smaller and paler form than in the north.

While the Virginia deer has been exterminated in such parts of its former range as Ohio, Indiana, Illinois, and Iowa, yet on the outskirts of their range, so to say, in Canada and the northern states, they are more than holding their own. Indeed, they often prefer to live near the settlements of men because their archenemy, the wolf, will not follow them there, the latter having a wholesome respect, fear, and deep-seated hatred for man and his works. They are even coming back into parts of their former range, such

as the Berkshire Hills in Massachusetts, where they have again become common.

Their main reliance against their enemies, man again being the chief one, is their scent and hearing, which are of the keenest, while their sight, though the eyes are large, does not seem to be so good.

In winter a family, or several families, will trample down the snow in a circle and make what is called a deer yard. The fawns are born in May, one, two, or even three at a time. They are secreted by the mother under a dense bush, and visited by her about six times a day. At this time does and bucks part company for several months.

Our western deer. In the great West, from western Iowa to California, Washington, and Oregon and from British Columbia, the Peace River country, and Manitoba to Mexico, lives the *mule deer*. It is a little larger than the white-tail, and has larger ears. The tail is much smaller, and white with a black tip. It lives more on bare hills and open places, and this, together with the fact that it is less wary than the Virginia deer, has made it disappear rapidly over much of its former range. And if it were found in such densely settled places as its white-tailed cousin it no doubt would have disappeared even more rapidly. The antlers of the mule deer are different, too, from those of the white-tail. They grow more nearly upward, and always branch in two tines (dichotomous).

Still farther west, in the coast region from Juneau in Alaska south to California, lives the *black-tailed deer*, which is quite similar to the mule deer, except that its tail is black.

The caribou. Our caribou are closely related to the Old-World reindeer. We have two species, the *woodland*

caribou and the *barren ground caribou*. The former is found in exactly the same range as the moose, but is rare everywhere, whereas the latter is found in the barren grounds and tundras around Hudson Bay and northward. The woodland caribou is brown in color, the other gray

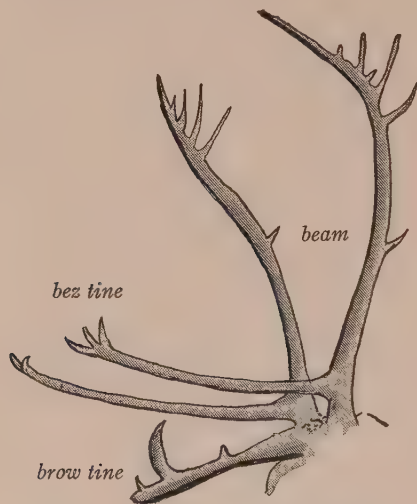


FIG. 143. Antlers of woodland caribou

or even white, the former being larger than the latter. Antlers are borne by both sexes. They are somewhat palmate or flattened in shape, not so graceful as those of the wapiti, and are thirty to fifty inches high. The brow tines come down over the forehead, almost over the eyes.

The barren ground caribou is an animal of the arctic tundra, the far northern moss and ice desert. There the frost never comes out of the ground entirely during the arctic summer. It thaws only from several inches to several feet down, below that the earth remaining frozen. Thus there is always, during the short but intense arctic summer, plenty of water between the tussocks of moss, lichen, or grass. And in winter the region is a vast ice and snow desert. How are the caribou fitted for life in such a habitat?

Their feet are large and flat, being formed by the two main hoofs, but the two upper and smaller hoofs also come down to a level with the large ones. Furthermore, the two large hoofs spread out when treading either the soft

mushy bog or the snow, and thus prevent sinking in, and having long, stiltlike legs like the moose, the caribou can negotiate snowdrifts when they do sink in.

Caribou are far from being as graceful as the deer. Their large clumsy feet, long spindly legs, and less graceful head and neck combine to give the animal a less pleasing aspect. Of the two species, the woodland caribou are the more solitary. Family groups of from five to twenty animals are the largest herds seen, while the barren ground caribou roam in enormous herds over the tundras of Labrador and the arctic regions. Ernest Thompson Seton saw a herd which he estimated at ten million. They eat the abundant moss found in their habitat, which, like the musk ox, they can get by pawing away the snow. The woodland caribou farther south have more to choose from, eating leaves and grasses, water lilies, and the like. Both are excellent swimmers.



After Schmeil

FIG. 144. *Skeleton of foot of the reindeer*

The reindeer. The reindeer of Lapland in northern Europe is one of the animals of which men make the utmost use, living as well as dead. The Lapps use it for drawing their sledges both summer and winter, they ride on it to church and to school, milk it, and when the animal is killed, make use of everything in and on its body. The bones are used for building sledges, the pelt for tents or clothing, the sinews for thread, and the meat, blood, and even the intestines are eaten.

This highly useful animal of the far north has now been introduced into Alaska and Labrador, and in both places it is doing very well. It gives work to the Eskimos and

Indians and is a necessary source of food for them. Already frozen reindeer meat is shipped to the cities of the north-western United States from Alaska.

Other deer. The European *stag* is very similar to our wapiti or elk, but smaller. It is a fine animal. The little *roe* is very common in the forests of Germany and Austria. It has small antlers, in shape somewhat like those of our pronghorn. The *fallow deer* is another small deer having



FIG. 145. *Reindeer in Lapland*

After Schmeil

palmate antlers. The young of all these are spotted with white. The *axis deer* of India is a dainty little creature, retaining the white spots of the fawn throughout life. The *musk deer* lives in the mountains of Asia and stands only about twenty inches high. It has no antlers, but there are two tusks in the upper jaw. It has a large musk gland, because of which it is eagerly hunted for the Chinese trade.

The smallest of all deer, the *pudu*, has recently been brought to the Field Museum of Chicago from Chile by Dr. W. Osgood. It stands only seventeen inches high, and its antlers are merely short spikes.



Photograph by Akdes; courtesy Field Museum

FIG. 146. *Giraffe*

GIRAFFES

The giraffe. The giraffe may be called the most fantastic of all deer. The little boy who, upon seeing one in



After Schmeil

FIG. 147. *Nubian giraffe*
Showing manner of tearing off
twig with narrow, worm-like tongue



After Schmeil

FIG. 148. *Nubian giraffe*
Note the position the animal must
assume when picking up something
from the ground or when drinking

a zoölogical garden, said to his mother: "Mamma, there ain't no such animal," may be pardoned for hesitating to believe the evidence of his own eyes. The enormously elongated neck which lifts the small head with its large eyes and ears and small ill-shaped horns to a height of fifteen to nineteen feet, together with the long front legs—longer than the hind ones, which make the back slope steeply—give the animal a most grotesque appearance. The color scheme also aids in this effect. On a ground of yellowish or brownish white are large round or elliptical brown spots in the southern species, or large polygonal spots in the northern one.

But we have repeatedly seen that when there is a peculiar structure in an animal, there is a very special use or need for it. So also in this case. The giraffe lives in the steppes of Africa. Here are groves of mimosa trees, which resemble our locust trees.

As the grass in these steppes often disappears entirely, owing to protracted droughts, the giraffe is fitted to browse on the foliage of the mimosa trees, so he has to be able to reach high up. Indeed, he often rears up on his hind legs to get up still higher, which must surely land his head in the third story of the trees.

Furthermore, the trees, like our locusts, are very thorny. Therefore the tongue of the giraffe is covered with an extremely hard, horny skin, and the skin of his body is also about an inch in thickness, to prevent painful laceration.

Giraffes are sociable, being found in small herds, probably family groups. They are very wary. Since they can see for a long distance, owing to the height of their head and their large, keen eyes, and since they are also provided with a keen scent, it is almost impossible for an enemy to approach them. When they move off they do so at a pace, making their lanky bodies swing from side to side, never stopping until they have put a considerable distance between themselves and the enemy. They can do without drinking for a long time. Giraffes are said to be mute throughout life, a statement which is denied by some.

The giraffe is certainly an odd and interesting animal.

The okapi. The enormous Congo forest is one of the few unexplored and perhaps unexplorable regions left in the world. It is so large and dense and so full of lurking



Courtesy Field Museum

FIG. 149. *Okapi, a lately discovered animal of the Congo forests*



Courtesy Quelle und Meyer, Leipzig

FIG. 150. *Dromedaries at the edge of the desert*

dangers, that no one has so far earnestly tried to penetrate into it, or succeeded if he has tried. In 1900 this big forest yielded an entirely new animal to the wondering gaze of the world. This was the okapi, which seems to be part giraffe and part zebra. It was Sir Harry Johnstone who first made it known to the civilized and scientific world. He heard from the natives about this strange beast, and he succeeded in getting them to bring him first parts of one, then a skin, and finally a whole animal. It is well shown in the picture (Fig. 149, p. 195). In size it comes between the giraffe and the zebra.

CAMELS

The camel. As the Laplander would find life practically impossible without his reindeer, the Tibetan without his

yak, and the Eskimo without his dog, so the inhabitants of the vast deserts of Africa and Asia would be almost helpless without the camel.

The camel is properly called the "ship of the desert." How, then, is it equipped for life in such forbidding regions? It can stand the extremes of heat and cold met with in the desert. It is strong, and can carry heavy loads of freight. It can go without water for days, as it has water cells in its stomach wherein can be stored an extra supply of water.



FIG. 151. *Skull of camel*

I, incisors, present only in fully adult animals; *C*, canines; *M*, the first stunted molars

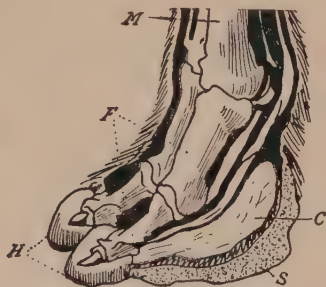


FIG. 152. *Forefoot of camel*

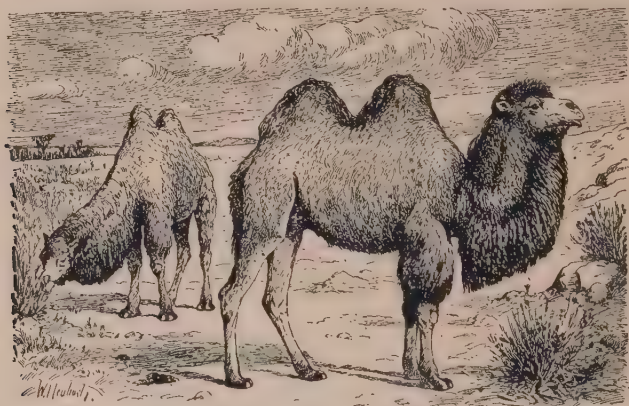
M, metacarpal; *F*, finger bones; *H*, hoofs; *C*, soft cushion; *S*, horny sole

Then there are the feet. Instead of hoofs it really has two broad rubber-like pads (Fig. 152), which spread out when touching the ground, even the soft sand, thus preventing the feet from sinking into it, as would the hoofs of a horse. The nostrils are slitlike and can be closed airtight when a sand storm or, worse yet, the poisonous simoom comes along. For the same reason the camel has double lids over its eyes.

The camel is a ruminant, but it has some features which make it quite distinct from other ruminants. The stomach has only three chambers instead of four. The camel has

incisors in the upper jaw as well as in the lower. It has no gall bladder. It has oval blood corpuscles instead of round ones, being the only mammal of which this is true.

In point of appearance, the camel must take a back seat, so to speak. It is an ungainly looking creature. Everything about it seems to be ill-shaped—the head, neck, legs, body, and even the hump or humps being far from ornamental. Its temper, like its appearance, is ugly. It will kick or bite the attendant who may have taken good care



After Schmeil

FIG. 153. *Two-humped or Bactrian camels in Asiatic desert*

of it for a long time and well supplied its wants, and will sometimes inflict ugly and dangerous wounds.

Contrary to popular belief, the name "dromedary" is not applied to the two-humped camel of Asia, but means any fast-riding camel, whereas the simple expression "camel" usually means a slow, freight-carrying animal. The two-humped camel is also called the *Bactrian camel*. It is found and used in Asia as far north as Siberia, and therefore has longer hair or wool than the one-humped animal. The

latter is found in northern Africa, notably in the Sahara Desert, Egypt, southwestern Asia, Arabia, and eastward across southern Asia. The finest camels are owned by the Arabs, who value their fast pure-blooded white riding camels as highly as they do their horses, and of many they can trace the pedigree as far back as that of their horses.

The camel is also trained to draw rude plows. Its milk and wool are used while it is alive, and when it is killed its flesh and skin are used also. There are no wild one-humped camels. All are now domesticated. But there are a few wild two-humped camels in the vast interior steppes and deserts of Asia.

The llamas. Knowing that there are no elephants, rhinoceroses, giraffes, or hippopotamuses in the western hemisphere—in North and South America—we are hardly prepared to hear that there are camels here. But such is the case. The llamas of South America belong to the camel family. It is true the llamas are much smaller than the Old-World camels, neither have they humps, but their heads and faces as well as their feet at once betray their kinship. Living in the high mountains, their hair or wool is even longer than that of the larger camels, and they hold their long necks straight up, bringing their small heads to an elevation of from four to six feet. Their two hoofs are also only rubber-like pads, which make the llamas sure-footed on rocky ledge and mountain path. And as the Arabs cannot live without the camel, so the inhabitants of the high Andes cannot live without the llama.

There are four kinds of llamas, two wild and two domesticated. The smallest, wildest, and darkest is the *vicuña*. It lives near the snow line among the peaks and precipices of the high mountains of Peru, where it climbs and jumps



Courtesy Field Museum

FIG. 154. *Guanaco, a domesticated and wild llama of South America*

about with the same disregard for danger as do our bighorn and mountain goat, and the chamois, ibex, and argali of the Old World. Here the Indians hunt it both for its flesh and its wool. The baby vicuña can run and frisk about right after its birth, which is remarkable, as the young of the camels are extremely helpless for a while after birth.

The *guanaco* is the larger of the two wild llamas. It is found from the high Andes of Peru and Bolivia to the hills and valleys of Patagonia and Tierra del Fuego. While the camels can hardly swim at all, this small wild camel is an expert swimmer, not hesitating to cross even the wide Strait of Magellan. When the guanaco is captured alive by the *gauchos* or cowboys of that region with their *boleros* (lassos with metal balls at the ends), it will offer no defense except that it turns toward its captor and discharges a load of evil-smelling saliva into his face. When guanacos feel their end approaching, they travel to certain places, usually a valley among the foothills, where they crawl under bushes

and await their end. Darwin found such a spot on the banks of the Santa Cruz River in Patagonia, where everywhere bleaching skeletons were lying about. An instance of an animal cemetery!

The llama proper is the more common of the two domesticated offshoots of the guanaco, and from it the whole group gets its name. It is larger than its wild ancestor and variable in color. When Pizzaro's hordes of Spaniards in 1532 invaded and conquered Peru they found the Indians keeping the llama in domestication, and they were not slow in continuing this custom. Its wool is used for making clothing, and it serves both as a riding animal and a beast of burden, especially to carry ore from the mines along hazardous mountain paths to the railway station or the smelter. "It was not uncommon to meet droves of three to five hundred, or even a thousand llamas, each laden with silver ingots, and the whole in charge of a single native." Only the male animals are so used, while the females are kept for their milk and flesh, which latter is much like mutton. Both living and dead, the llama is indispensable to the Indians.

The *alpaca*, another domesticated form of the guanaco, is bred solely for its fine hair or wool. All these animals



After Schmeil

FIG. 155. *Llamas crossing the Andes*

must have a thick covering of hair or wool to protect them against the severe climate of their habitat, the cold upper reaches of those lofty mountains.

UNGULATES HAVING A TRUNK, OR PROBOSCIDEANS

The elephant. Among the animals of a circus parade or those of a zoölogical garden, none attracts more attention

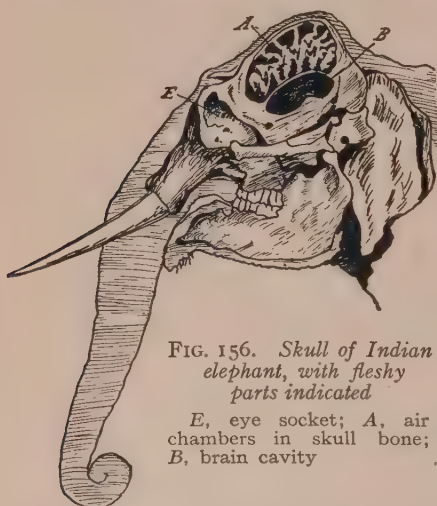


FIG. 156. *Skull of Indian elephant, with fleshy parts indicated*

E, eye socket; A, air chambers in skull bone; B, brain cavity

than the elephant. This is because of its large size and odd appearance. The whale is the largest of all animals, but as it lives in the ocean and is too big for any tank to hold it, we never see one. The elephant, however, is the largest land animal, and, since it can easily be tamed, it is the chief attraction of most collections of animals.

What gives the elephant its odd appearance? No doubt its trunk. This is in the first place a long nose, because nostrils run through it all the way. Secondly, it is the upper lip. You will never see an elephant eat like a horse or a cow—that is, bite off the grass from the ground. Its neck is too short for that, and its tusks would also prevent it. It tears off grass or branches with its trunk and puts the food into its mouth with it. Similarly, it cannot drink like other animals, but draws its trunk full of water and

squirts it into its mouth. Therefore the trunk is an arm, nose, lip, hand, and finger, all in one. In fact, on the rim of the disk which terminates the trunk there are one or two finger-like elongations (Fig. 158, p. 204) with which the animal can pick up the smallest object, even a pin. At the same time the trunk is strong enough to lift up a log or a cannon. The trunk, not the tusks, is also the chief weapon of offense and defense. With the trunk the elephant will pick up a tiger, lift it into the air, and hurl it to the ground to be crushed by the ponderous feet. This manifold use of the trunk is made possible by the great number of muscles in it, about forty thousand.

The tusks, too, give the elephant a unique appearance. They are long incisors, not canines as might be supposed. They are composed of dentine or ivory of the same grain or texture throughout, and so they can easily be cut or carved. They are used to batter down trees, and, among wild elephants, in the fights of the males, or bulls, for the possession of the females, or cows.

In size and bulk the elephant is truly remarkable. A fully grown elephant weighs more than six thousand pounds. We can readily understand then that the body must have special provision made to bear up and move this great

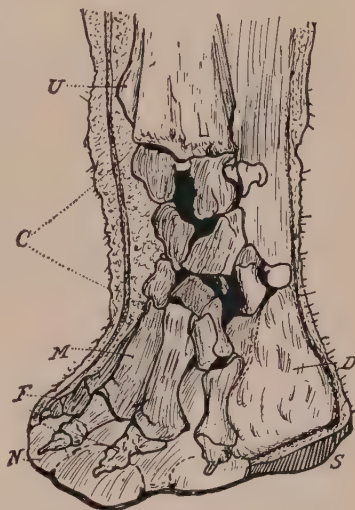


FIG. 157. *Right forefoot of Indian elephant*

U, ulna; C, carpal bones or wrist;
M, metacarpal or hand bones;
F, fingers; N, hooflike nails;
D, cushion of gristle; S, horny sole

weight. And so it has. Look at the legs! They are not well molded, gracefully curved limbs like those of the horse or deer, but are thick, round, shapeless pillars or columns

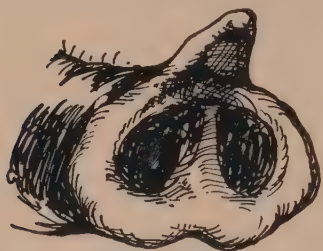


FIG. 158. *Disk, with finger-like projection, at end of trunk of Indian elephant*

designed to bear up a heavy weight. Even the toes are taken into the straight line, and all that can be seen of them on the outside are the nails. Also the heel is a thick cushion of strong sinew and gristle (Fig. 157, p. 203). As the hind legs are no longer than the front ones, jumping or galloping is impossible to the

elephants. They can only walk. Since the body of the elephant is short, again on account of its great weight, the two pairs of legs are placed close together and therefore it cannot walk cross-fashion, like the trotting horse, because it would step on its front feet continually. It must move both legs on one side of the body simultaneously, as a pacing horse does. However, as its legs are long, it can walk so fast that a man cannot keep up with it running at full speed, and a rider on horseback can do so only with some difficulty.

The head is very heavy, the neck extremely short, and the vertebrae in it very strong. The head cannot be long, because this would produce too great a leverage, so it is short but high. To make it lighter for the neck to bear up, the bones of the large skull are filled with air chambers (Fig. 156, p. 202). Because the head must be short there are only a few teeth in the jaw, large to be sure, but only three or four molars, ribbed with enamel ridges. When the foremost of these is considerably worn down it drops



FIG. 159. *African elephants*

Courtesy Field Museum

Note the large ears and receding forehead

out, the next moves into its place, and in the rear of the groove a new tooth is formed. Neither the teeth nor the tusks have roots. They keep on growing throughout life from the socket in the jaw. No need of dentists here!

The eyes of the elephant are small, the tail short. The cow elephant has the udder or milk bag between the front legs, not between the rear ones as the cow has. The external ear is large, up to three feet across in the African elephant.

What purpose is served by the huge bulk of the elephant? It lives in the jungles of Asia and Africa, and these, owing to the heat and moisture, are very dense. The animals here either live in the tree tops, as do the monkeys, or they are so thin in body that they can pass between the thick



Courtesy Quelle und Meyer, Leipzig

FIG. 160. *Indian elephants in primeval forest*

growth, like the tiger or the leopard. Not so the elephant. His bulk and weight enable him to crash right through, trampling the undergrowth underfoot and battering down small trees. So that thorns and broken branches may not lacerate his body, the skin is very thick, one to two inches. Only where there are folds is it thinner. Aside from a tuft of hair on the tip of the tail, there are only a few short bristly hairs scattered over the body.

What about its food? The elephant subsists on plant food, which is plentiful in its chosen haunts, eating grass, herbs, and branches of trees.

Elephants are sociable animals, living in small herds of from six to thirty. When they hear the least suspicious sound, which they easily detect by means of their large ears, they start off at their pacing gait, not stopping for

hours or even for the whole day, thus making it extremely difficult to follow them. When one is aroused to anger by a wound or by solicitude for a young one, it is a formidable enemy. This is especially true of the African elephant. It will then put forward its large ears, making with the width of the head a front of from eight to ten feet. Uttering a loud, shrill, trumpet-like call, it charges the enemy, and woe to him if he cannot stop the onrush in time by planting a large steel-coated bullet in the heart or brain. Running away will not help, for the elephant can easily overtake a man. Many a hunter has been trampled into a shapeless mass by an angry elephant.

There are two species of elephant, the Asiatic and the African. The former is found in the jungles of tropical Asia, especially in India, Siam, Ceylon, Sumatra, and Borneo. The latter lives in equatorial Africa, south of the Sahara. In South Africa, as in Cape Colony, it has already been exterminated. Elephants are the natural road makers through the jungle. In the mountains they are found up to an elevation of eight thousand feet.

The African elephant is in some respects a more interesting animal than the Asiatic. It is the larger of the two, and is even better fitted for a burden-bearer, as its back is concave, just right for a load to fit into. But it refuses to be domesticated. It has hardly ever been tamed, although some think that those used by the ancient Carthaginians were tamed African elephants. That is why all elephants seen in zoölogical gardens are of the Asiatic kind. And that is the reason too why the African elephant may be doomed to extinction. Africa is being opened to agriculture, and as the elephant cannot well exist side by side with agriculture, the lordly animal is probably doomed.

The differences between the two species of elephants are as follows:

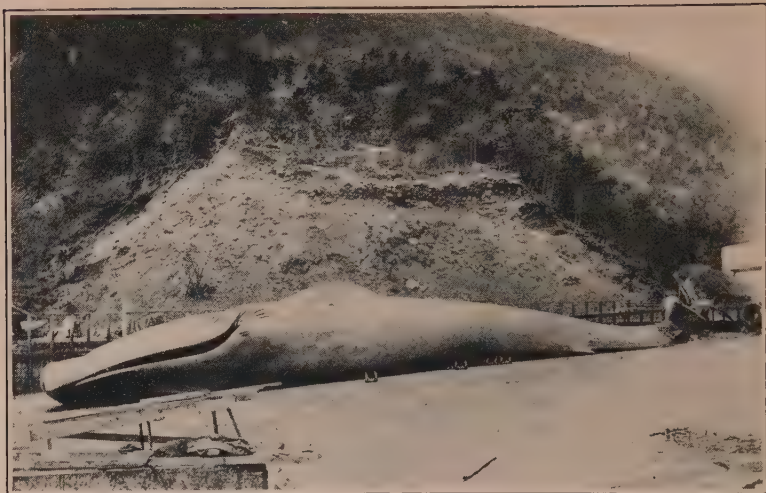
ASIATIC	AFRICAN
Smaller, up to 11 ft. high; average, 9 ft.	Larger, up to 12 ft. high; average, 10 ft.
Ears 18 in. long	Ears up to 3 ft. long
Eyes small	Eyes large
Forehead high and square	Forehead low and flat
Tusks smaller, 1 to 2 ft. long; many females having none at all	Tusks larger, 2 to 3 ft. long; largest ever found, 10 ft. 2½ in. long, weight of one, 228 lbs.; nearly all females have tusks
Five nails on front feet	Four nails on front feet
Four nails on hind feet	Three nails on hind feet
One finger on trunk	Two fingers of equal length on trunk
Back convex	Back concave
Skin a light yellowish gray	Skin darker
Eats grass and herbs	Eats twigs and branches of trees
Lies down to sleep	Stands up while sleeping, leaning against a tree

THE WHALES, OR CETACEANS

Among the whales we find the largest animals that now live or ever have lived. From the rocks of our western mountains, notably in Wyoming, are often dug the petrified skeletons of huge creatures that once must have lived in North America. These creatures in some cases attained a length of seventy-five feet or more. They were reptiles—huge lizards—called saurians. But the largest among the whales, the blue whale or sulphur-bottom, attains a length of ninety feet. This makes the elephant, the largest land mammal, seem puny. The weight of such a giant is calculated to be three hundred thousand pounds or over, or about one hundred and fifty tons, the weight of about two hundred oxen or thirty to fifty elephants!

Imagine, if you can, what enormous bones, especially backbone and legs, it would take to support this weight and bulk on land! Therefore whales live in the water. The water easily bears up the huge burden of the whale's body. From the fishes or the otter we know what shape of body is most advantageous to creatures living in the water, namely the cigar or spindle shape. But size and weight are not the only difficulties to be overcome in the whale. Another is that it breathes through lungs, not, like the fishes, through gills. Therefore it dares not go too far away from the surface of the ocean. It must be near enough to take a breath from time to time.

To perform such endless swimming would take muscles so strong and large as to be out of proportion for even so large an animal as the whale. This difficulty is overcome by the low specific gravity of the animal, or the low weight



Courtesy Field Museum

FIG. 161. *Blue or sulphur-bottom whale in whaling station in British Columbia*
Note the large size of the whale's head and its proportion to the entire length of the animal

in comparison with the mass of water pushed aside by it. This lightness is achieved by the relatively light skeleton, the bones being large-celled inside, and saturated with oil. Under the skin, furthermore, is a layer of blubber—very oily fat—to a depth of from eight to sixteen inches. Besides rendering the animal buoyant or light, it serves the important purpose of protecting it against deadly loss of bodily warmth in the cold waters of the Arctic or Antarctic ocean, where these sea monsters mostly live.

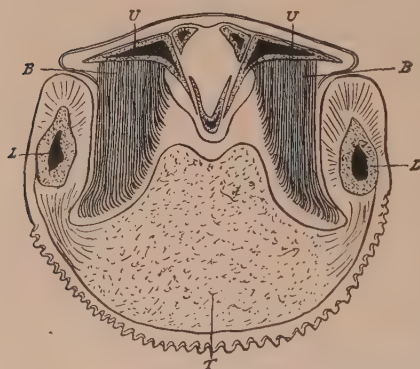
The lower side of the body is not like the sharp-lined keel of a ship, but broad, like the bottom of a canoe. Its skin is smooth, having no hair to cause friction. No hair is necessary to keep the warmth in the body and the cold out because of the layer of blubber under the skin. Neither are the graceful, torpedo-like lines of the body broken by

any limbs. There are no hind limbs at all, but only fore limbs which are in the shape of flippers or broad paddles. There are no outward ears. The whole body seems to function as a sound detector to the inner ear.

The head of the whale is very large, being about one third of the length of the body. The mouth is correspondingly large. If it were opened at the surface of the ocean a small boat could paddle into it and find room. The relatively small eyes—as large as the fist of a man—are situated right above the posterior end of the mouth. The body is propelled by means of the huge tail, which is placed horizontally, not vertically as in fishes. The tail is so powerful that one blow of it will reduce a ship's boat to kindling wood. Owing to its good propeller and its buoyancy, the whale makes trips over a wide expanse of ocean. Harpoons from whaling ships operating off the coast of Greenland have been found in whales killed on the coast of Norway and in Bering Sea, the latter case showing that some whales make the "northwest passage," so long sought after by mariners.

The whale is able to go to great depths in the ocean when attacked by man and to remain below water at least a half hour. This it is enabled to do because of the huge lungs, which take along a large supply of air into the depths. When it comes to the surface again the air is blown out of the blowhole near the tip of the head with such force that any water above the blowhole is forced upward like a miniature geyser. This water does not come from the lungs. Water there would kill the whale as surely as we drown when water gets into our lungs. The breath is so warm and moist that the contact with the cool air above turns it into steamlike vapor, thus giving the impression that a column of water is being hurled up, even when there is none.

What is the food of these huge beasts? Some of the smallest water creatures known—tiny crustaceans or crayfish-like animals a fraction of an inch in length. Of these, however, they find such large masses in the ocean that they are not merely kept alive but are well fed. Some of these small creatures fill and cover the ocean for square



After Schmeil

FIG. 162. Section through head of sulphur-bottom whale, mouth closed

U, upper jaw; B, baleen; L, lower jaw;
T, tongue

miles at a time, giving their color to the water. Through this food the whales of the whalebone variety swim with open mouth, closing it from time to time. Then the immense tongue presses against the palate above, expelling the water on both sides. The small food animals are kept in the mouth by means of the numerous large plates of whalebone hanging down

from the sides of the roof of the mouth like pieces of fringed-out carpet (Fig. 162). There are about four hundred such plates in the cavernous mouth, those of the bowhead or Greenland right whale being about a foot in width and from two to ten feet in length, while those of the sulphur-bottom or blue whale are only from two to three feet long. From these ragged plates the countless small food particles are brushed off and drawn into the gullet, which is in these species only large enough to swallow food no larger than a herring. Thus the largest whales show a highly specialized feeding adaptation.



Courtesy Quelle und Meyer, Leipzig

FIG. 163. *Blue or sulphur-bottom whales*

Note the whale calf suckling the mother

The whales have one young at a birth, that of the largest whales being twelve to fifteen feet in length when born. The mother suckles the young, called a calf, from the mammary gland or udder which is inclosed in a pocket or fold of the skin on the abdomen. The only sound emitted by the whales, besides the noise of their breathing, is a roar or bellow like that of a huge bull.

Some of these bulky denizens of the deep are nearing extinction at the hands of man. Their oil and whalebone have been valuable enough to lure man out into the frozen north and south to hunt them. Formerly the whalers killed them by hurling into them harpoons fastened to a long rope, but now explosive bullets, or even small bombs, are shot into them, by means of which their destruction is accomplished all the more rapidly. Of course, many a boat's

crew has never returned to its ship and even some ship's crews have never returned to their home port, the former having been killed by a blow from the huge tail of the monster writhing in its death agony, and the latter having been sunk by a storm far away from home.

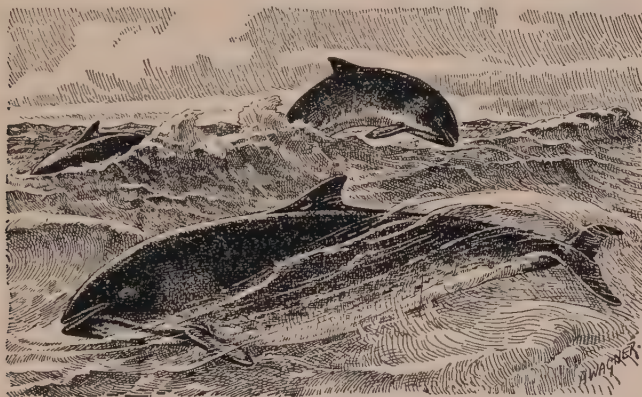
Species of whales. The Greenland or right whale or *bowhead whale* is the one that has been hunted longest and is therefore best known. Many a whaler has sailed from New Bedford, Gloucester, or Nantucket in Massachusetts after the "bone" and oil of this species. The larger ones are fifty to sixty feet long and are found in the northern circum-polar seas.

The *blue whale* or sulphur-bottom is the largest whale, reaching a length of ninety feet. It is found in the northern Pacific and Atlantic oceans. It is more gracefully built than the bowhead, and is bright yellow below, where the skin is also fluted or ridged, probably to aid in cutting the water and to help the animal in keeping its upright position.

The *sperm whale* or *cachalot* is an inhabitant of the warmer parts of the oceans. It has a huge, boxlike upper jaw which contains the valuable sperm oil, in which floats the even more valuable spermaceti, a waxy, odoriferous substance used in the manufacture of the costliest candles and in some drugs. The lower jaw is narrow and armed with large teeth, each standing apart from its neighbors. Its food is octopuses, cuttlefishes, and squids, which the cachalot attacks and swallows entire, including the two large beaks at the mouth of these uncanny creatures. In order that these squid bills shall not lacerate the wall of the stomach or the intestines of the whale, these organs excrete a waxy substance, called ambergris, which packs itself

around the dangerous hooked bills. This again is a valuable substance, used for the same purposes as the spermaceti.¹

A third family in the cetaceans is the *dolphins* or *porpoises*. Here we have the smallest members of the whale order. Some, as the common dolphin and the harbor



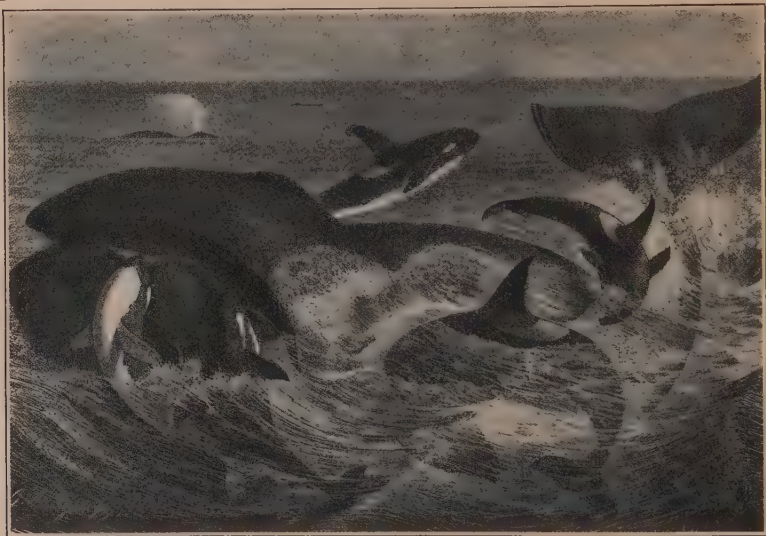
After Schmeil

FIG. 164. *Common dolphin*

porpoise, reach a length of only six to seven feet. These little whales are very sociable, a school of them often playing around an ocean liner, where everyone takes them for fish. Here also belongs the wolf of the ocean, the terrible *orca* or *killer*, which reaches a length of thirty feet, has a five-foot finlike flipper on the back, and hunts in packs which do not hesitate to attack the largest whales. They are extremely ferocious and voracious, as many as eight seals having been found in the stomach of one killer whale. They have large gullets, so that a man could pass through easily. They are a terror to the fishermen in the Gulf of St. Lawrence, whose nets they often tear in getting at the fishes caught in them.

¹Read *The Cruise of the Cachalot*, by Frank T. Bullen.

The *white whale*, eleven feet long, is as harmless as the killer is ferocious. When young it is slaty blue, but later pure white. It is a frequent victim of the killer whale.



After Brehm

FIG. 165. A pack of killer whales attacking a Greenland whale

The white whale rarely comes as far south as Long Island, preferring to stay in the Arctic Ocean.

The *narwhal* is peculiar for the long tusk protruding from its upper jaw to a length of five or six feet. This probably serves as a defensive weapon and for sparring matches among the males, as the antlers serve the deer. The tusk, which looks like a long twisted cane of bone, is really one of the two front teeth. There are no teeth in the lower jaw.

The Florida manatee. The manatees or *sea cows* are odd animals in more ways than one. They have whalelike bodies—that is, like small whales—but a head like a seal. Their flippers, which are the hands of the manatee, are more

flexible than in the whales and therefore can be used for more purposes. They have small eyes, a heavy upper lip, deeply cleft and forming a thick lobe in the middle. Their food is grass and other vegetation found on the bottom of shallow lagoons along the coast, and about the mouths of



After Schmeil

FIG. 166. *Indian sea cow or dugong*

Compare the shape of this animal with that of the sulphur-bottom whale

streams in the warmer parts of the world. The Florida manatees are found from Indian River around the coast of Florida, along the whole Gulf of Mexico, and southward. They attain a length of fifteen feet, but the majority are smaller, only nine or ten feet long. One kept in captivity ate from sixty to a hundred pounds of grass daily, and weighed 1,310 pounds. The sea cow gives birth to one young, which is about thirty inches long.

The manatees are as harmless and inoffensive creatures as can be imagined, yet in spite of that they have been in danger of extermination because tourists and native hunters shot them, often "just for fun." But now they are protected and are again increasing in numbers. When suckling her young, the manatee mother rises up from the water, clasping the baby to her breast with the flippers. This may have given rise in ancient times to the legends about mermaids, for another species of manatee was formerly found in the Mediterranean Sea.

TOOTHLESS MAMMALS, OR EDENTATES

The word "edentates" means toothless and is derived from the same Latin word as "dentist." There are three families in this order, armadillos, anteaters, and sloths. Of these, however, only the anteaters are entirely without teeth. The others have no incisors or front teeth and only a few molars. This order is an aggregation of odd animals—odd in appearance, or in habits, or both. We have but one species of this order in the United States, the queer armadillo.

The nine-banded armadillo. Armadillo is a Spanish word which means "little armor bearer." And it certainly has the proper name. The animal by that name is found from Texas south to the Argentine, mostly in Spanish-speaking countries. It is a small animal about thirty inches long, but instead of having a crop of hair or fur on the outside of the body, it is covered with a bony shell, something like a box tortoise. This shell is in two large sections which cover the front and rear parts of the body and are joined in the middle by eight bony rings which allow greater mobility to the animal, permitting it, in fact, to roll itself up into a ball. As the head has a bony plate in front, and the tail also is covered on top by bony plates clear to its end, the animal is practically invulnerable. By virtue of its armor it is enabled to rush or plow through a pack of dogs, which in vain try to fasten their teeth or claws into the smooth armor. On account of this efficient protection it can afford to be a slow animal. Its jogging trot, and the gallop it will break into when alarmed, are slow enough to allow a person walking fast to overtake it.

In this respect it is like the porcupine and the skunk, each of which has a different kind of protection to counterbalance its slowness. The armadillo also has weak vision, seeming not to be able to see a person until within thirty yards of him. In shape it resembles a small pig.

Besides its armor it has another defense, its digging ability. It really can "make the dirt fly." For this purpose



FIG. 167. *Armadillo*

its front legs are short and strong, and the feet are wide and armed with large claws. Digging seems to be as natural and easy for it as swimming is for a duck. In the burrow, which may be yards long, the four to eight young are born between February and April. These young have at first a covering like soft leather, but as they grow older the shell becomes harder.

Its food, which it finds mostly at night, consists of insects, mice, lizards, carrion, and, in fact, almost anything that is edible, even such small food as ants, maggots, and grubs from the ground. It may occasionally eat the eggs

of domestic fowl or of game birds; but it certainly is much more beneficial than harmful, and therefore should not be killed simply because it is easy to kill, but rather it should be protected.

The giant anteater. The anteater lives principally in South America. He is such an odd creature, and at the same time one showing such a nice adaptation to his sur-



FIG. 168. *Giant anteater*

Note the tubular head, the position of the eyes, the extensile tongue, and the bushy tail

roundings in his bodily structure and methods of food getting, that we ought to give him at least a passing thought.

His food is ants and termites. Of both there is a wonderful variety of kinds and number of individuals in South America. The termites build houses of mud around stumps or rocks, and this mud is so hardened by the sun that it is difficult to break into the houses. But the anteater is constructed for just such stunts. From tip of snout to end of tail he is seven to eight feet long, nearly half of this length going to the extremely long-haired tail, which he

holds over his back most of the time, perhaps as an aid in balancing or to make himself look like a heap of old dead grass. The hair feels more like dry grass or excelsior than anything else, and is of a black, brown, gray, and whitish color. His head is like a tube, long and round, the eyes high up on the head, so that when his muzzle is in the termite house he can still see what is going on around him. His ears are very small, because otherwise they would be in his way when he is running his head into the termite houses. In the head is an extensile round tongue, covered with a sticky saliva. His front legs are strong, and on the feet are very long and strong claws. That these may be kept sharp and not worn off, the anteater walks on the knuckles instead of on the ends of the toes.

When our anteater comes to a termite hill ready for a meal, he rears up on his hind legs and with his front claws finds a place where he can get a hold and then tears a hole into the hard-baked mud wall. Inside the structure are many stories or galleries filled with termites, their larvae and pupae. Into these galleries the anteater runs his tongue. All termites coming in contact with it stick fast and are drawn into the extremely small mouth, which has no teeth because for such small and soft food none are required. The panther and jaguar are the anteater's greatest enemies.

The sloths. The sloths live in the primeval forests from Central America to the Argentine in South America. They are entirely arboreal. The word "sloth" means slowness. And sloths are in truth the very incarnation of slowness. They are, as one has put it, slow to live, slow to move, and slow to die. The last is true, because they seem to have more than the proverbial nine lives of a cat.

They live in the trees, moving along the branches not, as one would suppose, along the upper side of them but along the *under* side, walking suspended and hanging suspended



After Schmeil

FIG. 169. *Family of three-toed sloths*

Sloths walk upside down on the under side of branches

by their long muscular legs, which are armed with two or three long curved claws. In the trees the sloths eat leaves and fruit, and sleep always suspended. The head, eyes, and ears are small, and there is a peculiar whimsical look in their dull eyes. The neck, to allow them to move or reach for their food, is long—longer in proportion than that of most mammals—having two vertebrae more than the others. When the animals rest, or when they sleep, they hang suspended or hug the limb or tree trunk and thus look like a bag or a hornets' nest suspended from the limb, or like an outgrowth from the trunk. The color of their coarse hair is in harmony with their home, being gray or greenish brown, like the bark of the trees on which they live.

POUCHED MAMMALS, OR MARSUPIALS

With the exception of the duckbill and the spiny anteater, all the native mammals of Australia belong to this order, which again includes some very odd animals. The reason they are provided with so-called pouches is this: Their young are born in so helpless and underdeveloped a condition that were they left as the young of other mammals are, they would speedily perish. Thus the young of the giant kangaroo, which is about five feet tall, are at birth the size of the young of our mice. The mother, therefore, places them in a pouch or fold of the skin on the abdomen, where, with their tiny mouths, they seize one of the teats or nipples of the milk gland and almost grow to it until they are large enough to move about and finally leave the pouch, which in the case of the kangaroo may take as long as eight months.

The kangaroo. The best known of the Australian marsupials is the kangaroo, a creature with small forelegs and fore part of the body, but immensely large hind legs, tail, and rear part of the body. With their strong hind legs and muscular tail, kangaroos are able to take enormous leaps, twenty or even thirty feet, and thus elude pursuit. They are also good swimmers. There are several kinds of kangaroos, from the giant



FIG. 170. *Left hind foot of giant kangaroo*
The figures indicate the order of the toes



FIG. 171. Giant kangaroos, pursued by dingoes or wild dogs, leap over a hunting party of Australian natives and their game—an emu, a black swan, a lyre bird, and a duckbill

kangaroo, five feet tall, to the rat kangaroo and tree kangaroo, which are about the size of a large rat.

Other Australian marsupials. Much like the kangaroos are the *wallabies*, of which there are several species. Then



After Schmeil

FIG. 172. *Giant kangaroos*

A young kangaroo is looking out of pouch of the mother

there are animals corresponding to our bears, only smaller, the *koala*; to our squirrel, the *phalangers*; to our dogs, the *Tasmanian wolf* and *Tasmanian devil*, the latter so called on account of his vicious, snarling disposition; and animals corresponding to our cats, rabbits, moles, and mice, but all pouched. One Australian animal, the *banded anteater*, has the greatest number of teeth of any mammal, having as many as fifty-six.

Many of these queer animals are disappearing, especially since white men have introduced other mammals from



Photograph by W. E. Carlin; courtesy Doubleday, Page & Co.

FIG. 173. *A Florida 'possum*

Europe, such as the fox, rabbit, dog, cat, cattle, and sheep, some of which kill the native mammals or at least eat the vegetation on which they subsist. One of these, the European rabbit, has multiplied so greatly as to become a scourge. The government has offered prizes for ways and means to exterminate this rabbit, but so far without avail—another instance of the folly of man interfering with the balance in nature.

The opossum. We have in America only one member, the opossum, of the family of marsupials or pouched mammals. You have no doubt heard the expression “playing 'possum.” It is derived from a habit of this animal. When overtaken by man, dog, or other large enemy before it can get into its hole or up a tree, it will suddenly roll over as if dead. Its eyes, jaws, and fur appear as though it had been dead for some time. No amount of kicking or abuse will bring any response, until the enemy is convinced that the



Photograph by W. E. Carlin; courtesy Doubleday, Page & Co.

FIG. 174. 'Possum hiding in palmetto, where he has been chased by a dog

opossum is really dead and goes away. Then just as suddenly the sly deceiver will get up and amble away as though nothing had happened. During the day it lives hidden away in some hole between rocks or roots, or in a cavity in a tree. At dusk, however, Mr. Opossum becomes active and prowls about for something to eat. In appearance it is a good deal like a small pig with its beady eyes, pointed snout, and naked ears and tail. And, like the pig, it is omnivorous. It eats anything and much of it. Here it snaps up an unfortunate mouse that did not notice its approach, there it catches a fat locust or digs out a chirping cricket. Lizards and small snakes are a welcome addition to its bill of fare. Now it finds the nest of a bird or a mouse, and eggs or young—and the old ones, too, if they do not get away in time—help make up a meal for it. In the South



Climbing



Looking out of nest



Photographs by A. R. Dugmore; courtesy Doubleday, Page & Co.

FIG. 175. "*Playing 'possum.*"

This is a picture of the same animal shown above, taken an hour or so later

it is the hereditary enemy of the cotton rat, which is a pest there. Thus it does some good. Carrion and vegetables are eaten to add variety to its diet. In many places it enjoys a bad reputation as a chicken thief. But there can scarcely be any doubt that, all things considered, it is more useful than harmful.

The opossum is a prolific animal, having two to three litters a year, with from five to fifteen young in each. The female sometimes has a set of diminutive young in the skin pouch or fold on the abdomen, and at the same time another set, a little larger, is clinging to her back, grasping her hair with their handlike feet, and, to steady themselves, winding their little tails around the mother's tail, which is curved over the back. The tail, in fact, serves as a fifth hand since it is prehensile—that is, the opossum can wind it around the limb of a tree and hang from it like a monkey until it has secured another hold with its feet somewhere else.

The opossum is about twenty-seven to thirty inches long. The hair is coarse, rough, of a dirty gray or smoky gray color, becoming brown on the legs and black on the feet. Some people, especially the darkies of the South, are very fond of its meat, and it is said that when it is prepared the way only a negro mammy knows, it makes a very toothsome meal. At any rate, it is an interesting animal, a peculiar natural monument. It ranges from the latitude of Chicago and Detroit south to Mexico and into South America, where there are several related species, some of which are very tiny and clothed with silky hair.

EGG-LAYING MAMMALS, OR MONOTREMES

The duckbill. No other part of the world has such an assortment of odd animals as Australia and the islands adjoining. When the first white settlers became somewhat acquainted with the natives, the so-called "black fellows," they were told by them of an animal with fur that laid eggs. The settlers took this to be a bit of fairy tale or superstition, such as is often found among savages. But in the course of time the story was found to be true. They found an animal about eighteen to twenty inches long, living in and near ponds and rivers, which came out at night (nocturnal) and had a bill like that of a duck. They called it the duckbill or ornithorhynchus. It could be seen playing on the surface of the water in the evening, but would dive and disappear at the first sign of danger. After much observation it was found to have burrows from thirty to



FIG. 176. *Duckbill, or ornithorhynchus*

fifty feet deep in the banks of streams or ponds, with one entrance below water and another above the water line,

usually under a bush or under some vegetation where it could not easily be seen. Finally, after much futile digging, the eggs were found. It lays two to four eggs, the usual number being two, in a nest at the end of the burrow, which is here enlarged. After a few hours or a day the young, which are completely formed at the time the eggs are laid, come out of the shell, which is softer and more elastic than



FIG. 177. Egg of duckbill,
young developed inside

that of the egg of our domestic fowl. It does not take any long hatching out. That is the reason it was so difficult to find nests with eggs, although young were often found.

Being an aquatic animal, the duckbill is fitted for such a life. All four feet are webbed, the webs extending beyond the claws, from which they can be folded back when the strong claws are wanted for digging the burrow. The body is spindle-shaped like that of the otter, seal, or muskrat. The legs are short, and so is the tail, which is furred, as is the whole body. The fur is brown and soft. The male has a spur on the hind legs with which it can inflict a vicious scratch or cut. Otherwise the duckbills' only defense is their nocturnal habit and their ability to dive and swim under water. Their food consists of small aquatic animals, such as snails, crabs, and mussels. They have only one molar on each side of each jaw. The snout is a bill like that of a duck—hence the name—with an extension of leathery skin beyond the base to protect the fur when the animal is searching the mud for food.

The ornithorhynchus or *platypus*, which is another name for this strange animal, lives in southeastern Australia and the near-by island of Tasmania.

The spiny anteater. In northeastern Australia and the island of Papua or New Guinea lives the equally fantastic spiny anteater, an animal twenty inches long, covered with spines like the European hedgehog, but with a long tubular snout and a long, round, wormlike tongue with which it catches ants. It would thus belong to the anteaters were it not for the fact that it also lays eggs, or rather one of them at a time. Before hatching, the egg is kept in a fold of the skin on the abdomen, where the young one is also kept after hatching. This seems, therefore, to be an egg-laying in addition to being a pouched mammal.

THE APPENDIX

HOW REMAINS OF EXTINCT MAMMALS ARE FOUND

In Siberia we have the most surprising instance of animals having been preserved for centuries by cold storage. It seems that large numbers of animals were suddenly exterminated by some force of nature, such as an abrupt change of climate from tropical warmth to boreal cold, or a great flood. Their floating bodies were carried about by the waters until caught by an eddy or swirl which piled numbers of carcasses together in certain places, where the receding waters left them on solid land or deposited them in some river or lake bed. Here large masses of earth would slide over them, loosened perhaps by rains or thaws or long-standing water. Then the earth would freeze again, with the mammoths in the ground.

Now the large rivers of Siberia, when at flood stage, often undercut their banks, making them slide into the river, and thus expose these ancient elephants with their hair, skin, flesh, and bones intact—an instance of preservation by cold storage that has our cold-storage warehouses beaten all hollow!

When such an uncovering of a mammoth occurs, wolves and the half-wild dogs of the natives see it first, as a rule, and immediately proceed to tear up the carcass before an attempt at preserving it can be made. Even the natives themselves are not above gorging themselves on the centuries-old flesh of these extinct monsters. Once a mammoth appeared after a landslide from the bank of one of these Siberian rivers, and stood upright near the new bank, because the lower part of its legs was still within the frozen ground. As luck would have it, a Russian scientist was just then staying in the adjoining village. The astounding news was brought to him, and quickly, with the help of natives, he succeeded in skinning the monster before the skin

could spoil. He preserved the skin, separated out the skeleton, and sent all to St. Petersburg (Leningrad). Here the skeleton was put together again and the skin mounted, just as taxidermists skin and mount animals of our own time. It may be seen to this day in the museum of the former capital of Russia.

Another interesting place, where the skeletons at least of animals have been preserved in perfect condition, is in our own country, on La Brea Ranch on the outskirts of Los Angeles. There is a pool here consisting of asphalt or natural tar. This wells continually from below, bringing up with it countless bones of extinct animals and of those which are still found. These are not petrified, but are preserved in their natural condition by the antiseptic oil and tar, in which they have been embedded for so long a time. Here are found bones of rhinoceroses, mastodons, horses, camels, cave bears, saber-toothed tigers, and numerous other animals now extinct in North America, and some of them extinct everywhere. It seems that the animals roaming about in that neighborhood in former centuries mistook the pool of asphalt for water, possibly for the reason that this pool would either all the time or now and then be covered with a shallow sheet of water.

When they waded in to drink, they became mired in the sticky stuff and slowly sank from view. And now the oil-saturated bones come to the surface in a steady stream.

Still another source of animal remains is the graves of prehistoric and other people, such as the mound builders and cliff dwellers in our country and the Peruvian Indians in South America. The ancient Egyptians even went to the trouble of making their dead animals into mummies, just as they did the bodies of their own dead. In Egypt are found whole cemeteries containing hundreds and even thousands of mummified ibises, crocodiles, monkeys, cats, hawks, and some even of the big sacred bulls. This for the reason that the Egyptians held all animal life sacred, and imagined the various animals to be dedicated to their several gods.

The most usual way of finding animal remains is in fossil or petrified form. In this way only bones or skeletons are found, and shells in the case of mollusks, never the soft parts. These fossil remains are found imbedded in and are a part of the rock. How did they get into the rock? It seems that the flood and other great catastrophes in nature killed off many animals at one time. The cadavers would be carried around awhile by the waters and then deposited on the sandy beaches of lakes, on the banks of rivers, and on the floors of valleys from which the water had drained off. The soft parts would disappear and only the skeletons remain. These, in turn, would be buried by sand that had dried out and was being carried around by the wind. These layers of sand would in a short time solidify, as there usually are particles of lime in sand, and change into rock. Before, during, and after this change water would seep through the rock, dissolving out the bones and shells imbedded in it, thus leaving a mold of them there, showing every detail of structure, down to the finest one. But the water seeping through the rock also carries dissolved limestone and other rock material. This would take the place of the bones and shells removed by the dissolving power of water, and thus produce an exact replica or likeness of the bone or shell that had been there before. Thus these fossil bones and shells are really not petrified bones and shells, but simply their molds filled out anew.

Later some of these layers or strata of rock would be lifted up by volcanic or other forces, making it possible to find these fossil bones, skeletons, and shells, also fossil coral and sponges, in cliffs and rocks high up in mountains. Such a place, for instance, is Dinosaur Park in northeastern Utah, and many places in Wyoming, Kansas, and along the Red Deer River in Alberta, Canada. In fact, one may go to nearly any quarry, gravel pit, or creek bed and there find fossil animal remains. The earth is a vast cemetery of man and animal remains. There are vastly more of either kind *below* the surface of the earth than living on it.

SUGGESTIONS TO TEACHERS

Science is more and more coming into its own in the elementary school. Some schools, however, still have no definite time set aside on their programs for the study of science, not because its value is doubted, but partly because of lack of time in a crowded curriculum and partly because of the difficulty in administering a science course efficiently in the grades. Where no separate lesson period is set aside for the study of science, the teacher certainly will seek and utilize all opportunities to meet the need in other ways.

To aid the busy teacher in solving his problem, the following suggestions are designed to show how the material offered in this book may be adapted to teaching situations in the regular school subjects. The fertile mind of the experienced teacher will see numerous other ways in which he may proceed to meet his own particular conditions and needs. The following may serve as a starting point.

READING

Silent reading of factual material plays an important part in life. Modern readers offer too little of such material. Some training in this type of silent reading is acquired in the so-called content subjects. This valuable ability must, however, receive more direct attention. Teachers who have felt this need will welcome the publication of *Our Great Outdoors*, for it offers worthwhile factual material in a form which is admirably adapted to this type of work. Besides its intrinsic interest to the child, the material is written in an interesting style and achieves the difficult and rare combination of scientifically accurate information written on the child level.

1. Have the children read one of the shorter sketches in this book, "The Gorilla" for example, under timed conditions. Instruct the children to read as rapidly as possible, with the knowledge that they will be held responsible for the facts read.

As soon as the child has finished reading the sketch, he will raise his hand. The teacher will write on the blackboard the minutes and seconds required by the child, and the latter will write the time on a blank piece of paper. After all have finished reading, they will be given a certain time to reproduce the facts read. Papers may be graded by the teacher or the class.

If the results are not satisfactory, give the children another chance to read the material and then to reproduce it again in a similar way.

2. Similar to "1." The teacher will have a list of questions prepared which the children will be asked to answer after their reading. It is preferable to have those questions duplicated and distributed to the children after their reading, or the teacher may write them on the blackboard.

3. Similar to "2," but let the children know the questions before reading.

For technique of setting questions and grading see any of the modern silent-reading tests. "True-false tests" prove interesting to children. After they have had several of these tests, they become greatly interested if the teacher will permit individuals or groups within the class to prepare such tests themselves.

LANGUAGE

1. The teacher may read one of the sketches aloud. Then the children will be asked to reproduce the material.

2. A better type of composition work is to have the child read the material himself and get the facts, which he will be asked to rearrange under some topic or problem. Examples:

Single article:

The Differences between Apes and Man

The Feeding Process of Ruminants

The Massacre of the Buffalo

Adaptation of the Camel to Life in the Desert

The Elephant's Trunk

Several articles:

Popular Fallacies regarding Some Mammals
How Mammals Defend Themselves
Protective Coloration of Mammals
Constant War among Mammals
Devotion of Parent Mammals to their Young
Food of Rodents
Damage Caused by Rodents
Value of ——— to Man
Man's Cruelty to Mammals
The Attitude of Carnivores toward Man
Curiosity of Mammals
Some Queer Habits of Mammals
Antlers
Adaptation of Mammals to their Surroundings

Exhaustive treatises are not expected. The aims are rather to lead the child into the material, to give him practice in gathering material, to exercise his powers to organize material, and to provide opportunities for training in economical silent reading, skimming rapidly over material not important for the present problem and centering attention upon the relevant material, to vary the rate of reading to varying needs, to train in selective reading and in judging relevant material. If a more complete treatment is desired, the topics may be limited to a family instead of the genus, that is, limiting mammals to rodents.

Another valuable type of composition is the comparison between two animals or species. Many such topics may be found, ranging from the comparatively easy "Comparison between the Asiatic Elephant and the African Elephant," which is given in outline form, to such topics as "Differences between the Carnivores and the Ungulates."

From experience:

The Monkeys at the Zoo
My Pet ——— (cat, dog, rabbit, or other animal)

- My Visit to the Buffalo at the Zoo
- A Trapping Experience
- Wild Animals I Have Seen (limit to one, if possible)
- A Raccoon Hunt
- My Experience with a ———

From imagination and experience:

- My Talk with the Sloth at the Zoo

From imagination:

- Shooting My First Lion
- Out-'possuming the Opossum
- A Battle between Two Bull Moose
- A Young Beaver's Diary

GEOGRAPHY

Have children use this book as a reference book when studying the animals of a certain region. The geography text usually does not supply sufficient material to give the child a clear concept.

DRAWING

Under the guidance of the teacher the reproduction of some of the excellent photographs and drawings contained in this volume may easily lead to an interest in drawing the same animal from nature, in which the child will be encouraged to portray the individual animal, not merely the type.

NATURE STUDY

Wherever possible, the child should be encouraged to visit the zoo to see these animals and to describe some of them to the class. If no separate period is available, use a language period which is devoted to oral work or training in speaking before the class. A class visit to the zoo will prove a delightful and profitable excursion. Encourage children to take note of mammals in their surroundings, and to tell the class about them, giving the individual touches so interesting to children, such as experiences with these animals or stories about them. A class may decide

to make a collection of pictures of mammals. Aim at whetting the appetite for more in order that the child may develop the desire, habit, and ability to observe the world about him with a greater degree of intelligence and appreciation. Wherever possible, encourage the child to study mammals at first hand and to compare his findings with the information given in this volume, and to supplement these brief sketches, thus leading him to the scientific attitude toward life about him.

A GLOSSARY

(An explanation of words and terms used in this book)

- abdomen.* Belly.
abdominal. Pertaining to the belly.
abnormal. Of unusual, extraordinary character; deformed; monstrous.
acute. Sharp-pointed.
ad- (in combination). To; towards.
adult. Grown to full size; mature.
aërial. Living or being in the air.
albinism. State of complete or incomplete whiteness; resulting from lack of pigment in the skin.
albino. An animal affected with albinism.
alimentary. Pertaining to the digestive organs.
ante- (in combination). Before.
anti- (in combination). Against.
antler. Horn of an animal of the deer family.
appressed. Pressed closely to the body or skin.
aquatic. Pertaining to or living in the water.
arboreal. Pertaining to or living in trees.
- barred.* Marked crosswise.
bez tine. The forward tine or prong in an antler, next above the brow tine.
bi- (in combination). Twice; double.
biology. The study of living beings.
boreal. Northern.
buff, buffy. Pale brownish yellow.
buttock. The rounded fleshy part of the hip.
- carrion.* The dead body of an animal.
cartilage. A white, hard, and solid, but elastic and flexible substance of the body; near-bone.
circumpolar. Found in the regions around the pole, the north pole being meant mostly.
class. Fundamental division of animals, such as the class of mammals.
concave. Hollowed, as the inner side of a curved line.
convex. Bulging upward; opposed to concave.
crepuscular. Coming out at dusk.

deciduous. Falling off or out.

dichotomous. Divided into pairs.

digitigrade. Walking on the toes, as a dog.

diurnal. Pertaining to or coming out in daytime.

edentate. Toothless.

elliptical. Like a drawn-out circle.

enamel. The hard, white substance covering the teeth.

epidermis. Cuticle or outer skin.

ex- (in combination). Out; away from.

extensile. Able to be extended or stretched out.

exterminate. To kill out; destroy utterly.

family. Fundamental division of animals, such as the family of cats.

fecundity. Fruitfulness.

feral. Wild, not tamed, applied to wild descendants of domestic animals.

fossil. Dug out of the ground; the mold of an organism filled out with mineral.

gland. A soft, fleshy organ in the body, in which a fluid is formed.

gluttonous. Greedy for food; voracious.

gregarious. Living in flocks or herds.

grotesque. Fantastic; absurdly incongruous.

gular. Pertaining to the upper fore-neck or throat.

habitat. Locality or region frequented by a species.

heliographic. Pertaining to signals made by means of sunlight.

hibernate. To winter; to pass the winter in torpor.

hoary. Pale silvery gray.

hybrid. Cross-born between two species; mongrel.

immature. Not yet adult.

instinct. The ability to do the right thing without knowing why; inherited, accumulated habit and experience.

lacerate. To tear or cut into shreds.

larynx. Adam's apple.

legitimate. Lawful; proper.

median. Lying in the middle line.

membrane. Thin, soft sheet stretched over an opening or cavity.

migration. Periodic wandering.

mobility. State of being able to move quickly.

monogamous. Mating with a single one of the opposite sex.

nictitating membrane. The third or inner eyelid of several animals, such as the cottontail and the hawks.

nocturnal. Pertaining to or coming out at night.

Northwest passage. The seaway from the Atlantic to the Pacific, north of North America.

omnivorous. Eating anything.

order. Fundamental division of animals, such as the order of rodents.

organ. An individual part of the body, having a certain work to perform.
Thus the eye is the organ of sight.

organism. A living body; a plant or animal.

palmate. Spread out like the palm of the hand.

pelage. The hair of a mammal taken collectively.

pharynx. Back part of the mouth, leading into the esophagus.

plantigrade. Walking on the whole sole of the foot, as the bear.

polygamous. Mating with two or more of the opposite sex.

polygonal. Pertaining to a many-sided figure.

posterior. Rear.

prehensile. Able to grasp.

proboscidean. An animal having a large or highly developed nose, as the elephant.

proboscis. Nose.

prospector. One looking for precious metals.

reforestation. Replanting the forest after it has been cut away or destroyed by fire.

rosette. A figure the parts of which are arranged around a common center, as the petals of a rose.

rutting. The mating of deer.

secretive. Given to hiding.

steppe. Grassy plain.

sub- (in combination). Under; less than.

subterranean. Underground.

tactile. Pertaining to the sense of touch.

taxidermy. The art of preparing and preserving skins so as to represent the appearance of the living animal.

terrestrial. Living on the ground.

tine. Prong of the antler.

unique. Unlike anything else.

vertebra. One of the bones of the spinal column.

voracious. Greedy for food.

vary. Watchful; shy.

whimsical. Freakish; queer.

withers. Ridge between the shoulder bones of some animals, as the horse.

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and teachers' libraries

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